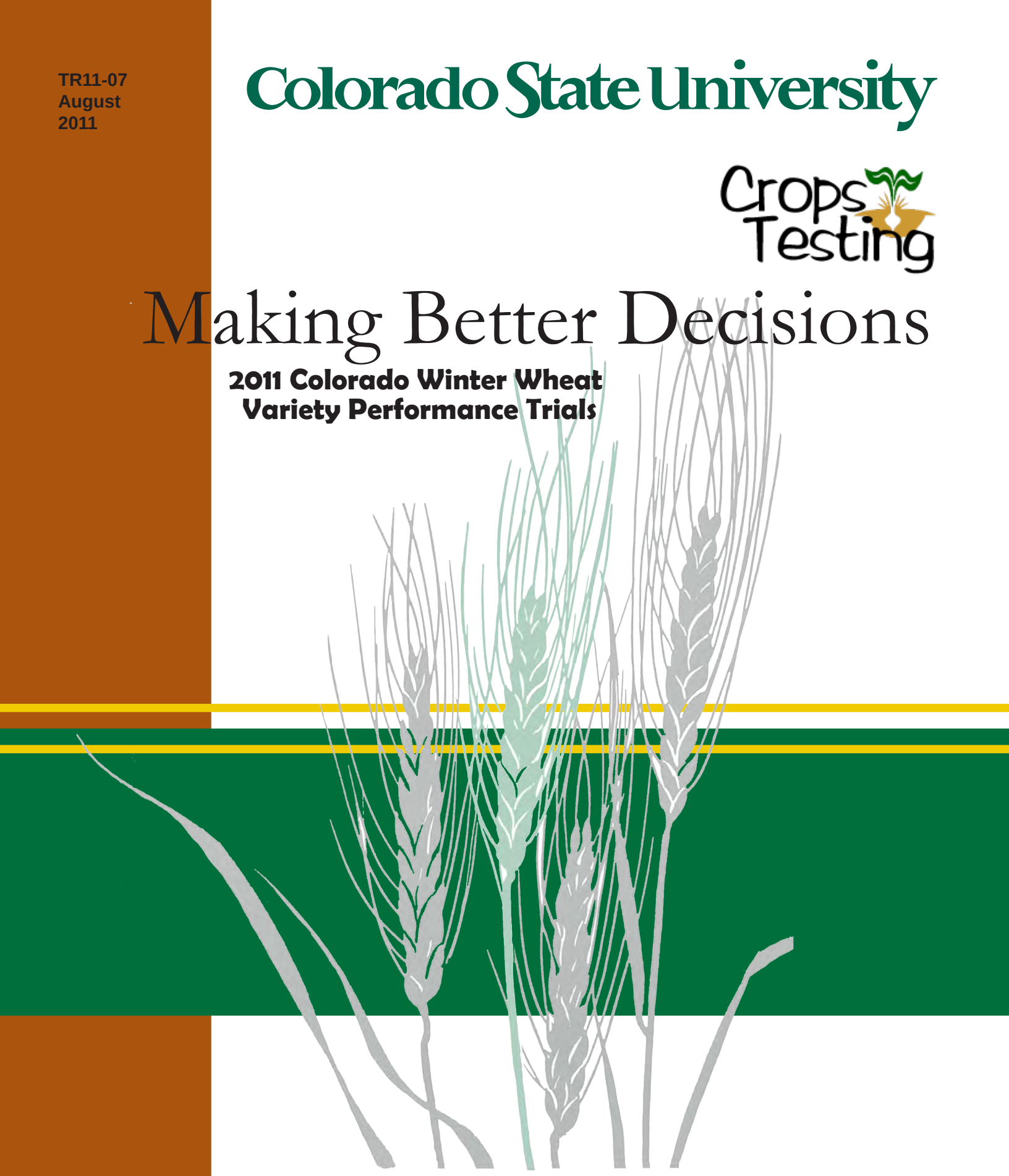
TR11-07
August
2011

Colorado State University

Crops Testing

Making Better Decisions

2011 Colorado Winter Wheat Variety Performance Trials



Agricultural Experiment Station

Department of Soil & Crop Sciences

Extension

Table of Contents

Authors

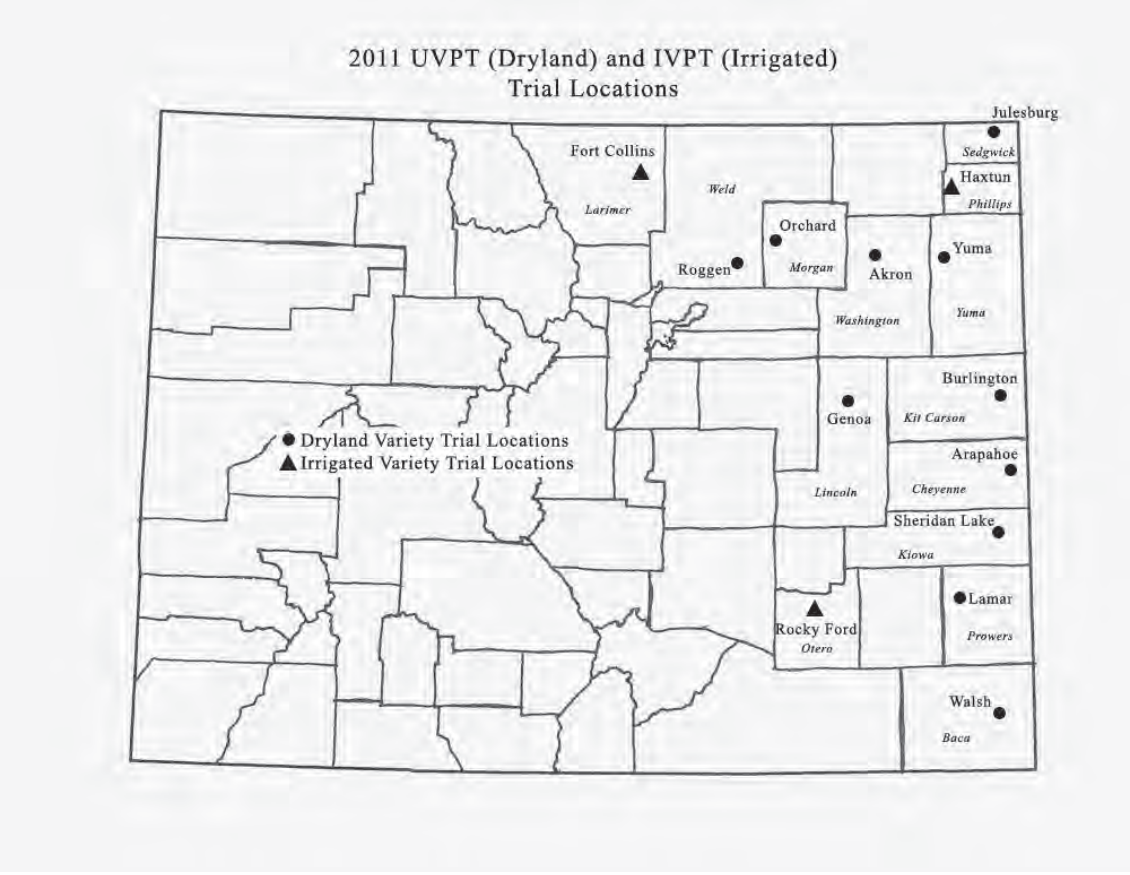
Dr. Jerry Johnson - Associate Professor/Extension Specialist - Crop Production, Colorado State University, Department of Soil and Crop Sciences, C12 Plant Science Building, Fort Collins, CO 80523-1170, phone: 970-491-1454, fax: 970-491-2758, e-mail: jerry.johnson@colostate.edu.

Dr. Scott Haley - Professor/Wheat Breeder, Colorado State University, Department of Soil and Crop Sciences, C136 Plant Science Building, Fort Collins, CO 80523-1170, phone: 970-491-6483, fax: 970-491-0564, e-mail: scott.haley@colostate.edu.

Dr. Mike Bartolo - Superintendent/Research Scientist, Colorado State University, Arkansas Valley Research Center, 27901 Road 21, Rocky Ford, CO 81067, phone: 719-254-6312, fax: 719-254-6312, e-mail: michael.bartolo@colostate.edu.

Kevin Larson - Superintendent/Research Scientist, Colorado State University, Plainsman Research Center, P.O. Box 477, Walsh, CO 81090, phone: 719-324-5643, e-mail: kevin.larson@colostate.edu.

Dr. Frank Peairs - Professor, Bioagricultural Sciences and Pest Management, Colorado State University, 102 Insectary, Fort Collins, CO 80523-1177, phone: 970-491-5945, e-mail: frank.peairs@colostate.edu.



2011 Eastern Colorado Winter Wheat Variety Performance Trials

Jerry Johnson and Scott Haley

Colorado State University provides current, reliable, and unbiased wheat variety information as quickly as possible to Colorado producers for making better variety decisions. It provides excellent research faculty and staff, a focused breeding program, graduate and undergraduate students, and dedicated agricultural extension specialists. However, wheat improvement in Colorado would not be possible without the support and cooperation of the entire Colorado wheat industry. On-going and strong support for a public breeding program is critical because variety development and testing is a long process, especially under the highly variable climatic conditions in Colorado.

Our wheat variety performance trials, and collaborative on-farm testing, represent the final stages of a wheat breeding program where promising experimental lines are tested under an increasingly broad range of environmental conditions. As a consequence of large environmental variation, Colorado State University annually conducts a large number of performance trials that serve to guide producer variety decisions and to assist our breeding program to more reliably select and advance the most promising lines toward release as new varieties.

2011 variety performance trials

Dry soil conditions characterized the fall 2010 planting at Burlington, Genoa, Roggen, Akron, and Orchard dryland trials. Variety trial emergence in the fall was poor to non-existent at these locations, and contributed to trial failure at Burlington, Genoa, and Roggen. Fall and winter precipitation was below average at most dryland trial locations and most of the dryland trials were showing significant drought stress coming out of the winter. Timely spring and early summer precipitation improved stands and growth at most locations. Sheridan Lake, Arapahoe, and Genoa trials were lost to heavy hail events that accompanied spring precipitation.
Brown wheat mite infestations were observed in SE Colorado and the dryland trial at Lamar was sprayed. Russian wheat aphid was not a problem in 2011 trials except at Walsh where insecticide was applied.

The Irrigated Variety Performance Trials (IVPT) at Fort Collins, Rocky Ford and Haxtun were excellent. Low levels of lodging were observed at Rocky Ford and Fort Collins although some entries were heavily lodged at Haxtun where very high yields were recorded. At Rocky Ford, barley yellow dwarf virus, tan spot, leaf and stripe rust, and brown wheat mites were present at low levels. Leaf rust, stripe rust, and barley yellow dwarf virus were present at Fort Collins which also had light hail damage.

There were 44 entries in the dryland performance trials (UVPT) and 26 entries in the irrigated performance trials (IVPT). All trials included a combination of public and private varieties and experimental lines from Colorado and surrounding states. All dryland and irrigated trials were planted in a randomized complete block design with three replicates. Plot size was approximately 180 ft^2 and all varieties were planted at 700,000 viable seeds per acre for dryland trials and 1.2 million viable seeds per acre for irrigated trials. Yields are corrected to 12% moisture. Test weight information was obtained from a combine equipped with a Harvest Master measuring system.

2011 Dryland Winter Wheat Variety Performance Trial at Akron

Variety	Yield	Test Weight	Plant Height
	bu/ac	lb/bu	in
T163	54.0	59.8	26
Camelot	53.8	61.0	26
CO050337-2	53.1	59.6	26
CO06424	51.2	60.4	30
CO08RWA050	50.4	60.1	27
Armour	48.7	60.0	22
CO050173	48.6	61.5	28
CO050303-2	48.2	60.6	31
Settler CL	47.8	60.4	28
Jagger	47.8	60.1	28
WB-Stout	47.6	58.2	26
Bill Brown	47.6	61.0	24
Fuller	47.4	60.5	27
Infinity CL	47.0	60.3	29
Winterhawk	46.9	60.8	29
CO07W245	46.5	60.5	26
CO07RWA15	46.5	60.1	27
CO050322	46.2	59.4	27
Hatcher	46.1	60.2	26
CO07MAS114	45.9	59.4	27
Everest	45.6	62.0	24
Above	45.6	58.9	22
CO06052	45.4	61.2	24
SY Gold	44.6	60.0	26
CSU Blend09	43.8	59.8	27
Snowmass	43.8	58.8	26
Thunder CL	43.7	59.1	28
Danby	43.6	62.2	29
CO07RWA2	43.3	60.2	28
TAM 112	43.2	62.3	25
SY Wolf	41.9	59.9	25
Smoky Hill	41.7	60.1	26
OK05312	41.6	60.2	26
Bond CL	41.2	59.0	28
Prairie Red	40.5	58.3	22
WB-Cedar	39.9	61.2	22
Duster	39.8	59.9	23
Ripper	39.2	59.4	21
CO050233-2	38.3	59.2	29
Greer	38.0	57.9	29
CO05W111	37.5	59.6	25
Robidoux	36.7	58.8	27
McGill	35.6	59.6	23
CO08RWA060	34.8	59.6	23
Average	**44.6**	**60.0**	**26**
$LSD_{(0.30)}$	5.5		

Harvest date: 7/19/2011
Planting date: 10/1/2010
Cooperator: Central Great Plains Research Center
Previous crop: Fallow
Fertilizer: 44 lb/ac of N and 14 lb/ac of P_2O_5
Herbicides: Round-up
Insecticides: None
Soil: Rago Silt Loam
Comments:
Field was exceedingly dry in the fall at the time of planting. Sparse fall emergence, mostly spring emergence. A slope in the field caused field variability. Field was hand weeded twice due to weed infestations caused by late-season precipitation that impeded harvest until field dried out. Ground still soft at the time of harvest. No significant disease or insect infestations.

2011 Dryland Winter Wheat Variety Performance Trial at Julesburg

Variety	Yield	Test Weight	Plant Height
	bu/ac	lb/bu	in
Ripper	67.8	57.8	33
SY Wolf	65.3	59.3	33
CO06424	65.1	59.7	32
CO07RWA2	64.4	59.0	33
CO05W111	63.9	57.7	37
CO07MAS114	63.4	57.1	35
CO050303-2	63.2	57.5	34
CO050233-2	62.3	58.0	33
TAM 112	62.0	60.1	34
Snowmass	61.9	58.1	36
OK05312	61.9	59.3	35
CO07W245	61.7	59.2	33
Hatcher	61.5	57.7	31
CO050337-2	61.0	57.1	34
Above	61.0	57.9	32
Smoky Hill	60.8	58.7	34
CO07RWA15	60.8	59.7	31
CO050173	60.6	59.3	36
CO050322	60.2	56.0	31
Bill Brown	59.7	58.7	34
Camelot	59.6	58.8	36
Winterhawk	59.5	59.2	34
Thunder CL	58.2	57.4	34
Settler CL	58.1	58.2	33
WB-Stout	58.0	56.0	34
Jagger	57.8	58.5	34
Danby	57.0	59.9	35
Everest	56.8	60.2	31
T163	56.7	56.6	35
Prairie Red	56.1	57.0	33
CSU Blend09	55.7	58.2	26
Bond CL	55.5	56.9	36
SY Gold	55.0	59.4	31
McGill	54.9	57.4	36
Fuller	54.8	58.0	34
Robidoux	54.6	58.3	35
Greer	54.4	57.3	33
CO06052	54.1	58.6	33
Armour	54.1	56.9	30
CO08RWA050	54.0	57.9	32
Infinity CL	53.6	57.5	34
Duster	53.3	57.5	32
CO08RWA060	51.9	58.4	33
WB-Cedar	51.0	58.1	28
Average	**58.7**	**58.2**	**33**
$LSD_{(0.30)}$	2.6		

Harvest date: 9/14/2010
Planting date: 7/20/2011
Cooperator: Jim Carlson
Comments:
Planted into good moisture, excellent emergence and fall growth, dry winter and significant early season drought stress (mid to late March), good rains by mid-April relieved stress, minor hail damage in early July. Leaf and stripe rust present at low levels. Tan spot, Septoria leaf blotch, and common dryland root rot more prevalent. Late rains reduced test weights. High temperatures during much of grain filling.

2011 Dryland Winter Wheat Variety Performance Trial at Lamar

Variety	Yield	Test Weight
	bu/ac	lb/bu
CO07W245	62.8	61.6
CO050322	61.5	61.7
CO050303-2	61.5	61.8
Hatcher	60.8	61.4
CSU Blend09	60.7	61.0
Bill Brown	60.2	61.2
CO06424	60.2	61.5
Snowmass	59.9	60.9
CO050337-2	58.8	62.0
Danby	58.2	62.9
Settler CL	57.6	60.8
Infinity CL	57.2	60.8
Above	56.9	60.8
CO050233-2	56.4	61.0
CO07MAS114	56.3	59.7
CO07RWA15	55.2	61.4
SY Gold	55.2	60.9
Duster	55.0	61.8
Bond CL	54.9	60.3
CO08RWA050	54.5	61.2
Ripper	54.3	60.4
Prairie Red	54.3	60.3
CO050173	54.3	61.2
Winterhawk	54.1	61.2
TAM 112	53.9	61.4
CO05W111	53.8	62.1
T163	53.0	60.9
Robidoux	52.1	61.5
CO08RWA060	51.3	60.5
Thunder CL	51.0	60.6
WB-Stout	51.0	60.7
Armour	50.6	61.0
McGill	50.5	59.5
CO06052	50.4	61.8
CO07RWA2	50.3	60.2
Fuller	50.1	60.9
Smoky Hill	50.1	60.9
OK05312	50.0	61.4
SY Wolf	48.9	60.8
Everest	48.9	62.0
Camelot	48.7	61.3
WB-Cedar	44.4	60.7
Greer	44.4	59.7
Jagger	42.7	59.4
Average	**54.0**	**61.0**
$LSD_{(0.30)}$	2.8	

Harvest date: 6/27/2011
Planting date: 9/27/2010
Cooperator: Jensen Stulp
Comments:
Soil moisture was very good at planting. Field sprayed for brown wheat mites. Field had good soil moisture from recent rains in mid-June. Yield and test weight were higher than expected from visual evaluation.

2011 Dryland Winter Wheat Variety Performance Trial at Orchard

Variety	Yield	Test Weight	Plant Height
	bu/ac	lb/bu	in
Prairie Red	52.3	55.1	23
Hatcher	51.1	57.0	26
CO050322	47.8	56.0	26
CO06424	47.8	57.0	29
SY Wolf	47.3	57.3	27
CO07W245	46.4	56.8	29
Bill Brown	45.9	56.9	22
CO050173	45.7	58.7	26
McGill	45.5	57.5	28
CO050233-2	45.3	56.4	26
CO07RWA2	44.1	57.7	25
Infinity CL	44.0	57.8	29
CO07MAS114	43.8	55.7	27
Thunder CL	43.6	55.6	25
Danby	43.6	58.6	24
TAM 112	43.5	58.5	27
CSU Blend09	43.5	57.4	25
Robidoux	43.4	56.9	28
Bond CL	42.4	56.4	26
Fuller	42.3	57.1	24
CO050337-2	42.2	56.6	27
Settler CL	42.1	57.7	23
CO08RWA050	42.1	56.3	28
Ripper	41.8	55.9	25
CO050303-2	41.4	57.3	30
Armour	41.4	56.5	23
Jagger	41.1	57.2	28
T163	41.0	56.1	22
CO05W111	40.9	56.5	28
CO06052	40.8	58.4	29
CO08RWA060	40.7	55.3	25
Camelot	40.4	56.6	27
Above	40.3	56.1	26
SY Gold	40.1	56.6	26
Everest	40.0	58.8	25
OK05312	39.5	56.8	26
Winterhawk	39.0	57.2	25
CO07RWA15	38.1	58.1	28
WB-Stout	37.2	55.2	26
Duster	36.2	55.8	27
Snowmass	36.0	56.3	27
WB-Cedar	34.4	61.5	23
Greer	30.8	54.8	26
Smoky Hill	29.4	59.8	24
Average	**42.0**	**57.0**	**26**
$LSD_{(0.30)}$	4.0		

Harvest date: 7/23/2011
Planting date: 9/28/2010
Cooperator: Cary Wickstrom
Comments:
Field was very dry at time of planting. Most plant emergence was not until early spring when high winds reduced young stands. Good May rains saved trial. Field was hand weeded twice due to weed infestations caused by late-season precipitation that impeded harvest until field dried out. No significant disease or insect infestations.

2011 Dryland Winter Wheat Variety Performance Trial at Walsh

Variety	Yield	Test Weight	Plant Height
	bu/ac	lb/bu	in
CO07W245	44.7	59.5	24
Hatcher	41.7	59.2	21
CO06424	41.2	58.5	25
TAM 112	40.9	58.9	24
Ripper	40.8	58.1	22
CO07MAS114	40.6	56.2	23
CO05W111	39.7	58.1	24
CO07RWA15	39.4	58.8	24
CO050322	39.2	57.9	23
CSU Blend09	39.2	58.2	21
Bill Brown	39.1	59.3	22
Duster	38.7	58.0	23
Above	38.6	57.9	22
Danby	38.2	59.3	22
Settler CL	37.9	57.9	22
WB-Stout	37.9	56.7	24
OK05312	37.9	59.4	22
Infinity CL	37.7	58.6	23
CO050303-2	37.6	59.8	23
CO08RWA050	37.1	57.8	21
SY Gold	37.0	58.4	23
Snowmass	36.9	58.2	23
CO050233-2	36.6	59.6	23
McGill	36.6	57.3	25
CO07RWA2	36.2	56.6	22
Prairie Red	35.8	57.7	20
Armour	35.3	57.7	20
Thunder CL	34.6	59.1	22
Greer	34.6	56.7	22
CO08RWA060	34.5	57.9	22
Robidoux	34.0	58.7	22
Winterhawk	33.9	59.6	24
CO050173	33.8	59.4	23
CO050337-2	33.8	58.1	21
T163	33.7	59.0	21
Bond CL	33.4	56.6	23
Smoky Hill	33.2	57.9	21
CO06052	33.0	59.6	23
SY Wolf	32.4	57.5	22
Camelot	31.9	58.4	24
Jagger	31.3	58.6	23
WB-Cedar	30.6	56.6	21
Fuller	28.5	57.8	22
Everest	27.8	57.1	20
Average	**36.3**	**58.2**	**22**
$LSD_{(0.30)}$	3.1		

Harvest date: 6/27/2011
Planting date: 9/28/2010
Cooperator: Plainsman Research Center
Previous crop: Fallow (the site is wheat-fallow rotation)
Fertilizer: 50 lb/a of N (preplant as NH_3), 20 lb/a of P_2O_5 (seedrow applied)
Herbicides: 0.3 oz/a of Ally Extra, 0.38 lb/a of 2,4-D ester
Insecticides: Lorsban (for RWA control)
Soil: Richfield Silty Loam
Comments:
Good emergence followed by dry conditions until harvest. Russian wheat aphid infestation surpassed the economic threshold and Lorsban was applied for control. Considering the dry weather, yields were much better than anticipated.

2011 Dryland Winter Wheat Variety Performance Trial at Yuma

Variety	Yield	Test Weight	Plant Height
	bu/ac	lb/bu	in
CO06424	70.4	59.2	34
CO07W245	66.6	58.9	34
OK05312	63.7	58.5	33
Snowmass	62.5	59.2	35
CO07MAS114	62.0	55.9	33
CO050233-2	61.8	59.0	33
CO050303-2	60.8	59.2	33
Ripper	59.8	56.9	29
SY Wolf	59.6	56.0	32
TAM 112	58.5	59.7	32
Settler CL	58.2	56.3	30
CO07RWA15	58.2	58.8	33
CO050337-2	57.8	58.2	33
Robidoux	57.5	58.3	32
CO05W111	57.3	58.2	33
CO050173	57.2	59.0	30
CO07RWA2	56.9	58.3	35
Winterhawk	56.7	58.6	33
SY Gold	56.0	57.9	31
CO050322	55.9	58.0	32
Above	55.8	57.2	32
Hatcher	55.4	58.1	30
CSU Blend09	55.4	57.7	29
Duster	55.1	57.8	31
Danby	54.4	54.1	31
Infinity CL	54.1	56.4	33
CO08RWA050	53.9	57.5	33
Prairie Red	53.7	55.4	28
Bill Brown	53.5	58.8	29
Camelot	53.0	57.2	33
Everest	52.5	57.6	30
Bond CL	51.6	55.2	31
CO06052	51.3	55.1	31
T163	50.8	56.8	31
Jagger	50.4	55.8	29
Thunder CL	49.8	57.1	30
McGill	49.6	57.4	33
WB-Stout	49.4	54.5	33
Smoky Hill	48.6	58.4	31
WB-Cedar	48.4	56.8	28
CO08RWA060	48.4	56.2	33
Greer	47.2	56.3	32
Armour	46.9	55.1	27
Fuller	45.6	55.8	31
Average	**55.3**	**57.3**	**32**
$LSD_{(0.30)}$	3.1		

Harvest date: 7/15/2011
Planting date: 9/14/2010
Cooperator: Bill and Steve Andrews
Comments:

Good fall emergence and growth, early season drought stress relieved by spring rains, several diseases present but at low levels (tan spot, Septoria, leaf rust, stripe rust, barley yellow dwarf virus). Minor hail damage in late June. Very hot during much of grain filling.

Summary of 2011 Dryland Variety Performance Results

Origin[a] and Release Year	Variety[b]	Market Class[c]	Yield[d]	Yield	Test Weight	Height
			bu/ac	% of avg	lb/bu	in
CSU exp	CO06424	HRW	56.0	115%	59.4	30
CSU exp	CO07W245	**HWW**	54.8	113%	59.4	29
CSU 2004	Hatcher	HRW	52.8	109%	58.9	27
CSU exp	CO050303-2	HRW	52.1	108%	59.4	30
CSU exp	CO07MAS114	HRW	52.0	107%	57.3	29
CSU exp	CO050322	HRW	51.8	107%	58.2	28
CSU exp	CO050337-2	HRW	51.1	105%	58.6	28
CSU 2007	Bill Brown	HRW	51.0	105%	59.3	26
CSU 2006	Ripper	HRW	50.6	104%	58.1	26
TX/W 2005	TAM 112	HRW	50.3	104%	60.2	28
NE 2008	Settler CL	HRW	50.3	104%	58.6	27
CSU 2009	Snowmass	**HWW**	50.2	103%	58.6	29
CSU exp	CO050233-2	HRW	50.1	103%	58.9	29
CSU exp	CO050173	HRW	50.0	103%	59.9	29
CSU exp	CO07RWA15	HRW	49.7	103%	59.5	29
CSU 2004/2006	CSU Blend09	HRW	49.7	103%	58.7	26
CSU-TX 2001	Above	HRW	49.7	103%	58.1	27
AP 2011	SY Wolf	HRW	49.2	102%	58.5	28
CSU exp	CO07RWA2	HRW	49.2	102%	58.6	29
KSU 2005	Danby	**HWW**	49.2	101%	59.5	28
OK exp	OK05312	HRW	49.1	101%	59.3	28
NE 2004	Infinity CL	HRW	49.0	101%	58.6	30
CSU exp	CO05W111	**HWW**	48.9	101%	58.7	29
CSU 1998	Prairie Red	HRW	48.8	101%	57.3	25
CSU exp	CO08RWA050	HRW	48.7	100%	58.5	28
WB 2007	Winterhawk	HRW	48.4	100%	59.4	29
T 2010	T163	HRW	48.2	99%	58.2	27
AP 2010	SY Gold	HRW	48.0	99%	58.9	27
NE 2008	Camelot	HRW	47.9	99%	58.9	29
WB 2010	WB-Stout	HRW	46.8	97%	56.9	29
CSU 2008	Thunder CL	**HWW**	46.8	97%	58.2	28
CSU 2004	Bond CL	HRW	46.5	96%	57.4	29
NE 2010	Robidoux	HRW	46.4	96%	58.8	29
OK 2006	Duster	HRW	46.4	96%	58.5	27
WB 2008	Armour	HRW	46.2	95%	57.9	24
CSU exp	CO06052	HRW	45.9	95%	59.1	28
NE 2010	McGill	HRW	45.4	94%	58.1	29
KSU 2009	Everest	HRW	45.3	93%	59.6	26
KSU 1994	Jagger	HRW	45.2	93%	58.3	28
KSU 2006	Fuller	HRW	44.8	92%	58.3	28
WB 2006	Smoky Hill	HRW	44.0	91%	59.3	27
CSU exp	CO08RWA060	HRW	43.6	90%	58.0	27
AP 2009	Greer	HRW	41.6	86%	57.1	28
WB 2010	WB-Cedar	HRW	41.4	86%	59.2	24
		Average	48.5		58.6	28

[a]Variety origin code: CSU=Colorado State University; CSU-TX=Colorado State University/Texas A&M University; WB=WestBred (Monsanto); AP=AgriPro (Syngenta); T=Trio (Limagrain); TX/W=Texas A&M release, marketed by Watley Seed Co.; KSU=Kansas State University; NE=University of Nebraska; OK=Oklahoma State University.

[b]Varieties ranked according to average yield in 2011

[c]Market class: HRW=Hard Red Winter Wheat; **HWW**=Hard White Winter Wheat

[d]2011 average yield and test weight based on six 2011 trials.

Summary of 2-Yr Dryland Variety Performance Results

Origin[a] and Release Year	Variety[b]	Market Class[c]	2-Yr Average[d] Yield	Yield	Test Weight	Height
			bu/ac	% of avg	lb/bu	in
CSU exp	CO06424	HRW	61.9	113%	59.9	30
CSU exp	CO050303-2	HRW	59.0	108%	61.0	31
CSU exp	CO050322	HRW	59.0	108%	59.5	29
CSU exp	CO050173	HRW	58.1	106%	61.4	30
CSU exp	CO050337-2	HRW	58.1	106%	59.9	30
CSU exp	CO050233-2	HRW	57.6	105%	59.8	30
NE 2008	Settler CL	HRW	56.8	103%	59.8	28
CSU exp	CO05W111	**HWW**	56.4	103%	60.4	31
CSU 2004	Hatcher	HRW	56.4	103%	60.1	28
CSU 2007	Bill Brown	HRW	55.9	102%	60.1	28
CSU 2006	Ripper	HRW	55.7	101%	58.7	28
WB 2007	Winterhawk	HRW	55.6	101%	60.9	30
CSU 2009	Snowmass	**HWW**	55.4	101%	60.1	31
CSU 2004/2006	CSU Blend09	HRW	55.3	101%	59.5	28
NE 2004	Infinity CL	HRW	54.6	100%	60.0	31
TX/W 2005	TAM 112	HRW	54.6	99%	60.5	29
CSU-TX 2001	Above	HRW	54.4	99%	59.3	29
KSU 2005	Danby	**HWW**	54.0	98%	61.3	29
NE 2008	Camelot	HRW	53.8	98%	60.1	31
AP 2010	SY Gold	HRW	53.6	98%	60.4	29
CSU 2004	Bond CL	HRW	53.6	98%	58.2	30
CSU 2008	Thunder CL	**HWW**	53.5	98%	59.1	29
WB 2008	Armour	HRW	53.4	97%	58.9	26
CSU exp	CO06052	HRW	53.1	97%	60.5	29
CSU 1998	Prairie Red	HRW	52.7	96%	58.4	28
KSU 2009	Everest	HRW	52.4	95%	60.8	28
OK 2006	Duster	HRW	51.8	94%	59.9	29
WB 2010	WB-Stout	HRW	51.8	94%	58.0	30
KSU 2006	Fuller	HRW	50.9	93%	59.6	29
WB 2006	Smoky Hill	HRW	50.8	93%	59.9	28
KSU 1994	Jagger	HRW	50.3	92%	59.6	30
		Average	54.9		59.9	29

[a]Variety origin code: CSU=Colorado State University; CSU-TX=Colorado State University/Texas A&M University; WB=WestBred (Monsanto); AP=AgriPro (Syngenta); TX/W=Texas A&M release, marketed by Watley Seed Co.; KSU=Kansas State University; NE=University of Nebraska; OK=Oklahoma State University.

[b]Varieties ranked according to average 2-yr yield

[c]Market class: HRW=Hard Red Winter Wheat; **HWW**=Hard White Winter Wheat

[d]2-yr average yield and test weight are based on nine 2010 trials and six 2011 trials.

Summary of 3-Yr Dryland Variety Performance Results

Origin[a] and Release Year	Variety[b]	Market Class[c]	3-Yr Average[d] Yield	Yield	Test Weight	Height
			bu/ac	% of avg	lb/bu	in
NE 2008	Settler CL	HRW	56.8	104%	59.8	29
CSU 2004/2006	CSU Blend09	HRW	56.5	104%	59.6	29
CSU 2009	Snowmass	**HWW**	56.3	103%	60.3	31
CSU 2006	Ripper	HRW	56.3	103%	59.1	29
CSU 2004	Hatcher	HRW	56.3	103%	60.1	28
CSU 2007	Bill Brown	HRW	56.0	103%	60.3	29
WB 2007	Winterhawk	HRW	55.6	102%	60.9	30
TX/W 2005	TAM 112	HRW	55.6	102%	60.9	29
CSU-TX 2001	Above	HRW	55.5	102%	59.5	29
CSU 2004	Bond CL	HRW	55.3	101%	58.5	30
NE 2004	Infinity CL	HRW	54.9	101%	59.9	31
KSU 2005	Danby	**HWW**	54.4	100%	61.0	29
CSU 1998	Prairie Red	HRW	54.1	99%	58.9	28
NE 2008	Camelot	HRW	54.0	99%	60.0	31
AP 2010	SY Gold	HRW	53.9	99%	60.3	29
CSU 2008	Thunder CL	**HWW**	53.6	98%	59.3	29
OK 2006	Duster	HRW	53.5	98%	59.9	30
WB 2008	Armour	HRW	53.5	98%	58.9	26
WB 2006	Smoky Hill	HRW	52.5	96%	60.0	29
KSU 2006	Fuller	HRW	51.4	94%	59.3	29
KSU 1994	Jagger	HRW	50.7	93%	59.6	29
		Average	54.6		59.8	29

[a]Variety origin code: CSU=Colorado State University; CSU-TX=Colorado State University/Texas A&M University; WB=WestBred (Monsanto); AP=AgriPro (Syngenta); TX/W=Texas A&M release, marketed by Watley Seed Co.; KSU=Kansas State University; NE=University of Nebraska; OK=Oklahoma State University.

[b]Varieties ranked according to average 3-yr yield

[c]Market class: HRW=Hard Red Winter Wheat; **HWW**=Hard White Winter Wheat

[d]3-yr average yield and test weight are based on ten 2009 trials, nine 2010 trials, and six 2011 trials.

2011 Collaborative On-Farm Test (COFT) Results

The objective of the 2011 COFT was to compare performance and adaptability of popular and newly released CSU varieties (Snowmass, Hatcher, Ripper, and Bill Brown), and promising commercial varieties from WestBred (Winterhawk) and Watley Seed (TAM 112) under unbiased, commercial-scale testing conditions. The COFT program is in its 13th year and much of Colorado's 2011 wheat acreage was planted to winter wheat varieties that have been tested in the COFT program. In the fall of 2010, twenty-three eastern Colorado wheat producers planted COFT trials in Baca, Prowers, Kiowa, Cheyenne, Kit Carson, Washington, Yuma, Phillips, Logan, Adams, and Weld counties. Each collaborator planted six varieties in side-by-side strips (approximately 1.25 acres per variety) at the same time and at the same seeding rate as they seeded their own wheat. Despite the difficult 2010-2011 growing conditions, viable harvest results were obtained from 20 of the 23 tests.

The COFT trial results need to be interpreted based on the average across all tests within a year and not on the basis of a single variety comparison on a single farm in one year.

Eastern Colorado Extension Wheat Educators

Bruce Bosley - Extension Agronomist, Logan County, 508 South 10th Avenue, Suite 1, Sterling, CO 80751-3408, phone: 970-522-3200, fax: 970-522-7856, e-mail: d.bruce.bosley@colostate.edu.

Dr. Wilma Trujillo – Extension Agronomist, Prowers County, 1001 South Main, Maxwell Annex Building, Lamar, CO 81052, phone: 719-336-7734, fax: 719-336-2985, e-mail: wilma.trujillo@colostate.edu.

Alan Helm - Extension Agronomist, Phillips County, 127 E. Denver, PO Box 328, Holyoke, CO 80734-0328, phone: 970-854-3616, fax: 970-854-4347, e-mail: alan.helm@colostate.edu.

Ron Meyer – Extension Agronomist, Golden Plains Area, 251 16th Street, Suite 101, Burlington, CO 80807-1674, phone: (719) 346-5571, fax: (719) 346-5660, e-mail: rf.meyer@colostate.edu.

2011 Collaborative On-Farm Tests (COFT) Variety Performance Results

	2011 Varieties[a]													
	Bill Brown		Hatcher		Snowmass		Ripper		Winterhawk		TAM 112		COFT Average	
County/Town	Yield[b]	Test Wt	Yield[b]	Test Wt	Yield[b]	Test Wt	Yield[b]	Test Wt	Yield[b]	Test Wt	Yield[b]	Test Wt	Yield[b]	Test Wt
	bu/ac	lb/bu	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/Bennett	48.0	61.0	45.4	59.5	38.7	60.5	40.5	59.5	49.4	62.0	39.5	62.0	*43.6*	*60.8*
Baca/Vilas	18.0	60.0	17.5	61.5	15.4	57.0	20.6	61.0	19.8	61.5	18.4	60.5	*18.3*	*60.3*
Baca/Walsh	26.4	61.0	26.3	61.0	26.0	62.0	28.3	61.0	24.3	62.0	23.5	61.0	*25.8*	*61.3*
Bent/Lamar	23.6	60.5	25.6	60.5	24.0	60.0	27.6	59.0	20.7	58.0	22.2	59.0	*23.9*	*59.5*
Cheyenne/Arapahoe	24.7	59.3	24.2	59.5	24.0	59.5	25.3	59.0	20.3	59.5	19.2	60.0	*23.0*	*59.5*
Cheyenne/Cheyenne Wells	68.6	59.0	58.8	62.5	58.4	62.0	58.8	60.5	58.3	61.5	63.1	60.0	*61.0*	*60.9*
Kit Carson/Bethune	52.8	61.7	45.0	60.2	50.0	59.7	46.0	59.5	47.1	60.2	40.1	59.7	*46.8*	*60.2*
Kit Carson/Stratton	88.4	60.5	84.4	57.5	87.0	59.2	87.1	59.4	76.0	55.7	84.1	59.7	*84.5*	*58.7*
Logan/Fleming	66.6	61.5	67.4	60.5	65.9	61.5	63.8	60.5	62.8	62.0	63.3	62.0	*65.0*	*61.3*
Logan/Peetz	18.7	60.0	21.5	59.0	17.0	59.0	13.9	56.0	17.1	60.0	14.6	60.0	*17.1*	*59.0*
Phillips/Haxtun	71.0	59.0	77.2	60.0	80.5	60.0	71.0	58.0	80.5	60.0	80.5	60.0	*76.8*	*59.5*
Prowers/Lamar	23.9	59.0	28.8	62.5	25.6	62.0	24.5	60.5	17.9	61.5	23.0	60.0	*23.9*	*60.9*
Washington/Akron	48.7	59.0	52.3	58.0	45.8	58.6	48.0	56.5	46.0	60.0	44.2	58.5	*47.5*	*58.4*
Washington/Akron E	60.1	56.5	60.2	56.0	56.4	56.0	58.6	57.5	55.7	58.0	63.0	57.5	*59.0*	*56.9*
Washington/Lindon	65.6	60.5	59.5	60.5	56.1	62.5	55.3	61.0	60.7	62.0	60.1	62.5	*59.5*	*61.5*
Weld/Keenesburg	64.8	58.5	69.5	58.5	49.8	58.5	54.7	58.5	41.5	60.0	58.0	59.0	*56.4*	*58.8*
Weld/Keenesburg S	48.5	57.0	47.8	55.5	40.9	56.0	42.0	56.0	43.7	57.0	42.7	57.0	*44.3*	*56.4*
Weld/New Raymer	33.3	57.5	31.6	57.0	31.4	55.5	33.3	55.5	28.3	57.5	29.5	58.0	*31.2*	*56.8*
Yuma/Wray	59.6	54.0	66.2	56.3	65.9	58.0	55.1	54.0	76.1	59.0	62.1	57.0	*64.2*	*56.4*
Yuma/Yuma	30.6	60.0	30.4	60.0	31.6	59.0	31.6	60.0	31.0	60.0	26.1	60.0	*30.2*	*59.8*
Average	47.1	59.3	47.0	59.3	44.5	59.3	44.3	58.6	43.9	59.9	43.9	59.7	*45.1*	*59.3*
Significance[c] Yield	A		A		B		B		B		B			

$LSD_{(0.30)}$ for yield = 1.3 bu/ac

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

[b]Yield corrected to 12% moisture

[c]Significance: Varieties with different letters are significantly different from one another based on the LSD values (1.3 bu/ac for yield)

2011 Collaborative On-Farm Tests (COFT) Variety Performance Comparisons

			Locations with Yields Above or Below Overall 2011 Median Yield				Locations North and South of I-70			
	2011 Overall (20)[1]		Above Median (10)[1]		Below Median (10)[1]		North (14)[1]		South (6)[1]	
Variety[2]	Yield[3,4]	Test Wt	Yield[3,4]	Test Wt	Yield[3,4]	Test Wt	Yield[3,4]	Test Wt	Yield[3,4]	Test Wt
	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu
Bill Brown	47.1 A	59.3	64.6 A	59.0	29.6 A	59.5	54.1 A	59.1	30.9 A	59.8
Hatcher	47.0 A	59.3	64.1 A,B	59.0	29.9 A	59.6	54.2 A	58.5	30.2 A,B	61.3
Winterhawk	44.7 B	59.9	62.2 B,C	59.8	27.3 B	59.9	52.4 B	59.5	26.9 D	60.2
Snowmass	44.5 B	59.3	61.6 C,D	59.6	27.4 B	59.1	51.2 B, C	58.9	28.9 B,C	60.4
Ripper	44.3 B	58.6	59.8 D	58.5	28.8 A	58.8	50.1 C	58.0	30.8 A	60.2
TAM 112	43.9 B	59.7	61.9 C,D	59.6	25.9 C	59.8	50.6 C	59.5	28.2 C,D	60.7
LSD $_{(0.30)}$	1.2		2.1		1.2		1.5		1.6	

[1]Number of locations used

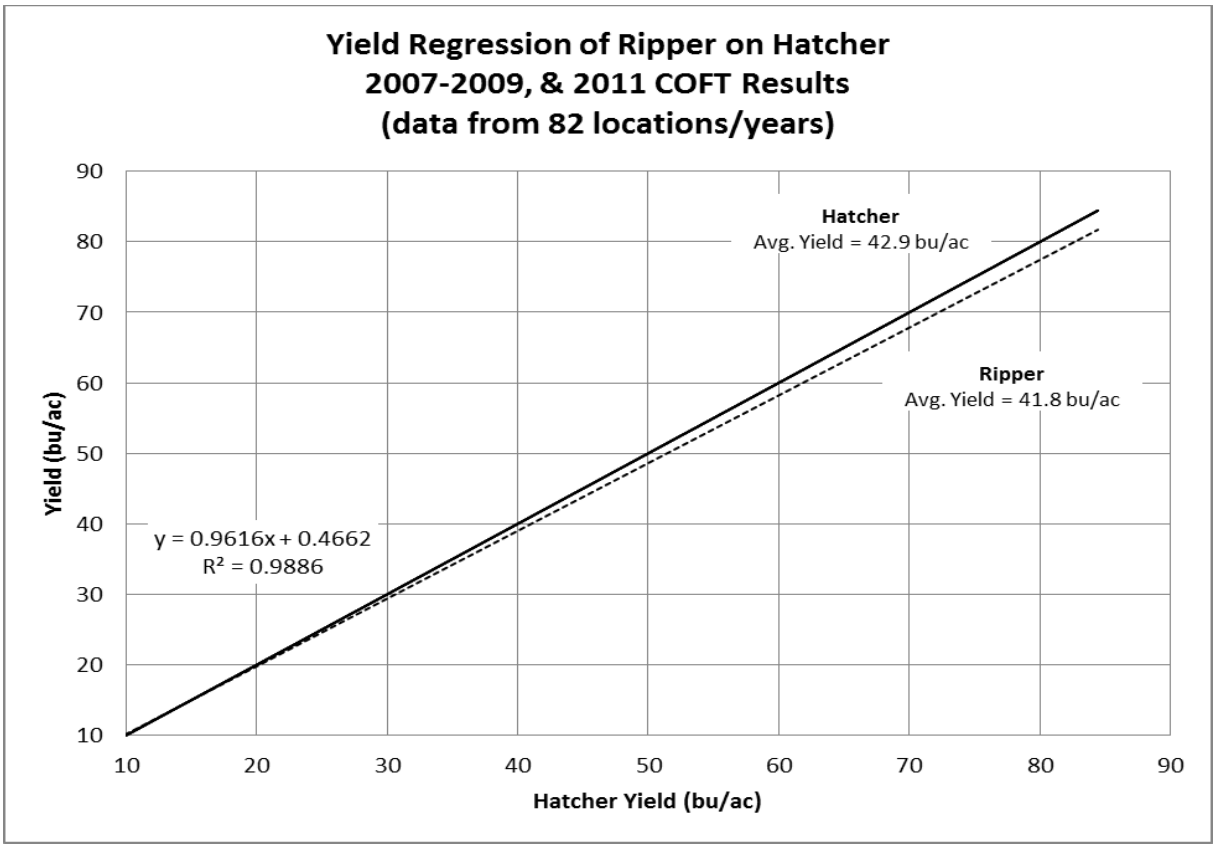
[2]Varieties are ranked by highest average yield overall

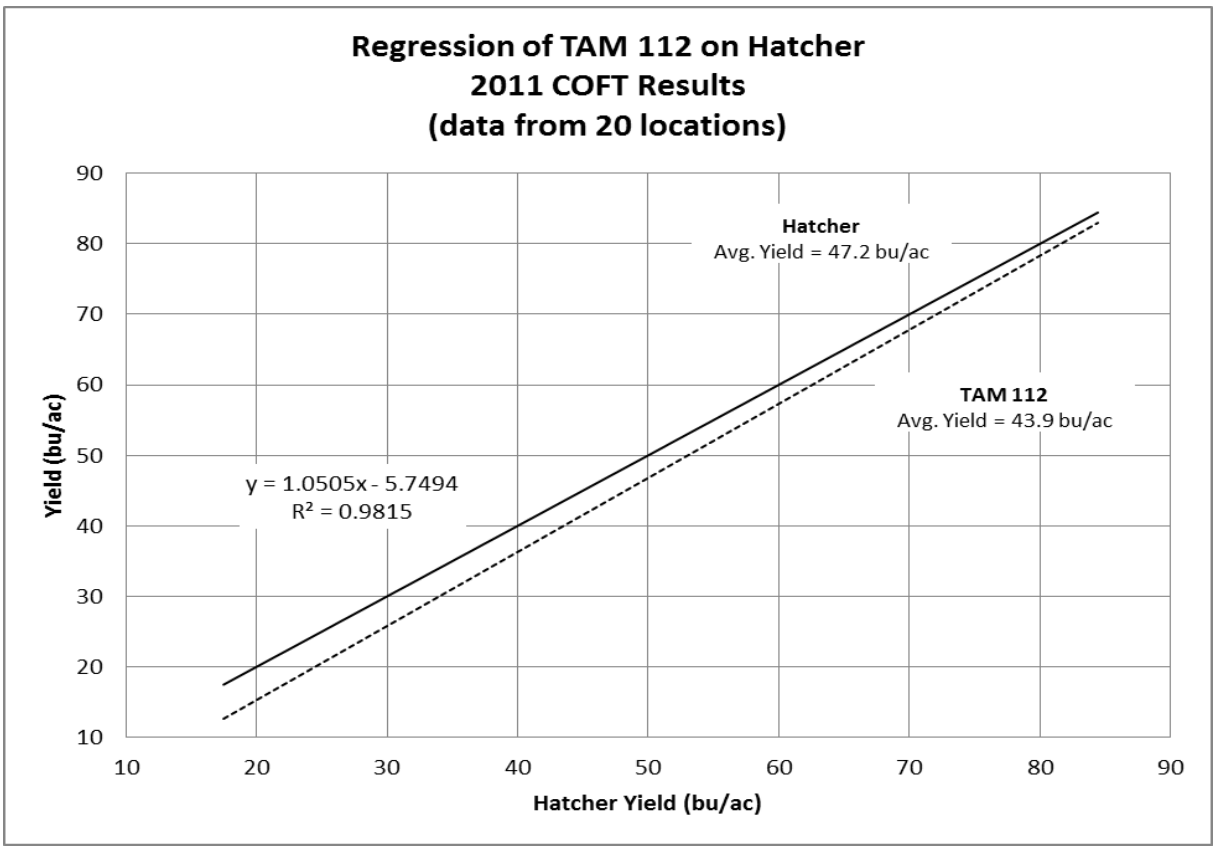
[3]Yield corrected to 12% moisture

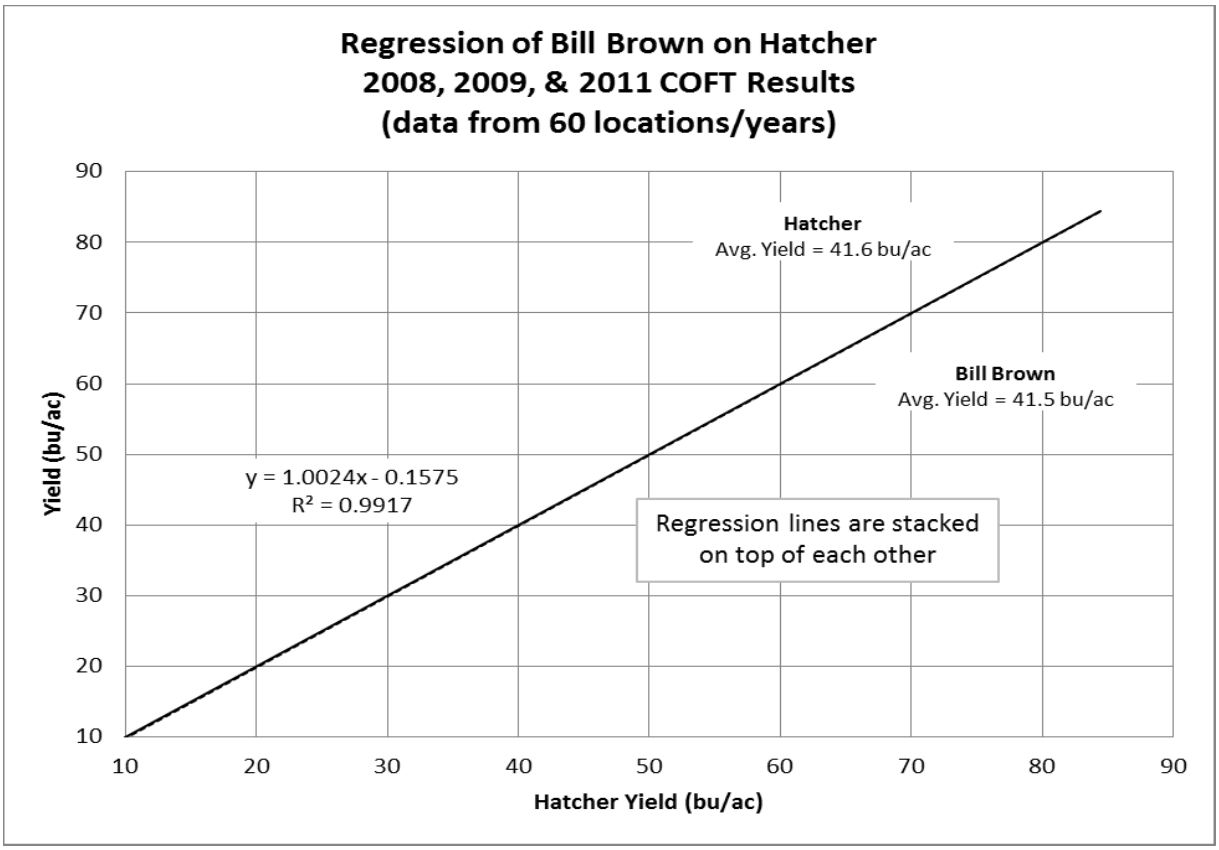
[4]Significance: Varieties with different letters are significantly different from one another based on the LSD values

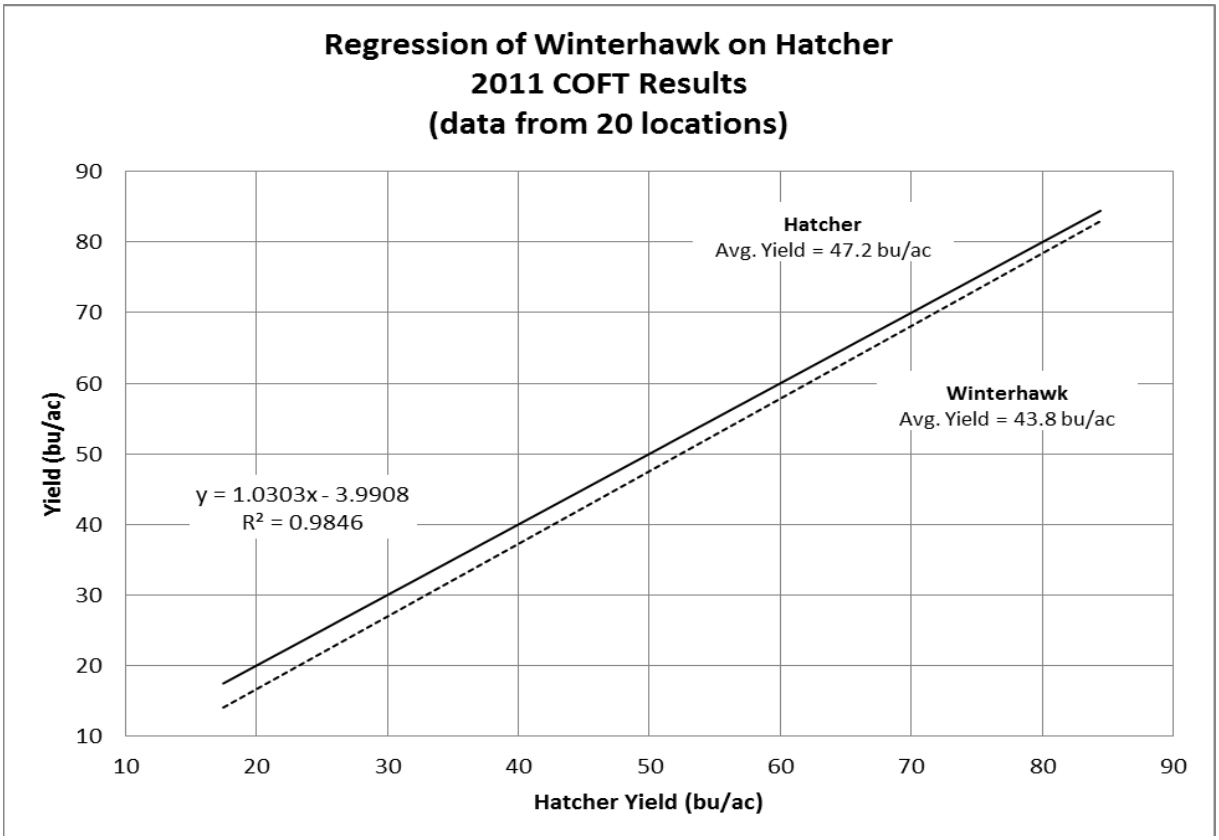
Yield Regressions to Compare Expected Performance of Varieties

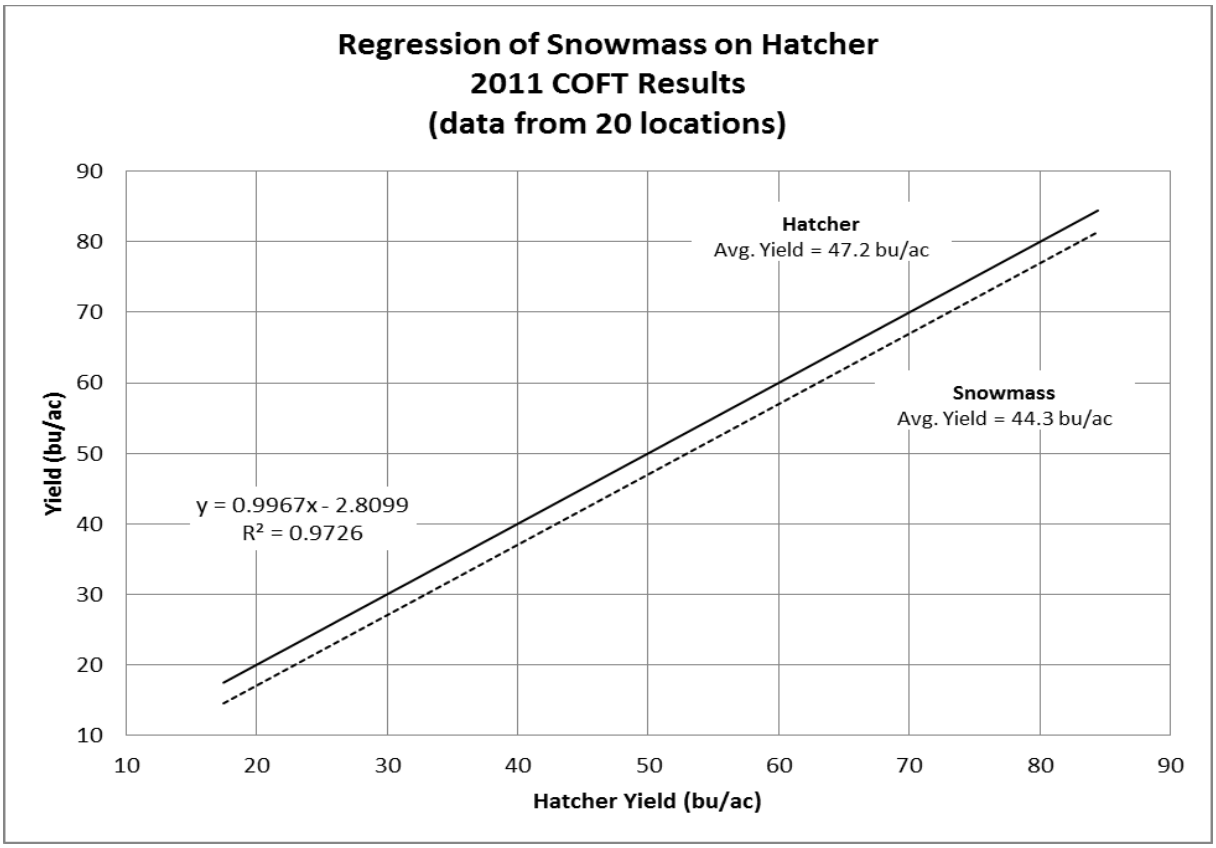
The linear regressions on the following pages are based on Collaborative On-Farm Trial Results over locations and years. They show yield comparisons of two varieties per graph and can be used as a tool to help growers visualize the expected performance of each variety in low-to-high yielding environments. In the event that lines cross over one another, the yield at the point of intersection is where we would expect one variety to be superior to another. Hatcher, currently the most popular variety is included in most graphs so farmers can predict the yield of the other variety given the yield of Hatcher. The equation shown in the bottom left of each graph can be used to predict the expect yield of a variety given a yield of the variety listed on the bottom (x-axis) of the graph. For example, for the first regression, the expected yield of Ripper = 0.9616*(yield of Hatcher) + 0.4662. If Hatcher yield is 80 bu/ac you would expect the yield of Ripper to be 77.4 bu/ac. The R^2 value of the regression is a statistical measure that represents how well a regression line fits the actual data points. R-squared values equal to 1.0 means that 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.

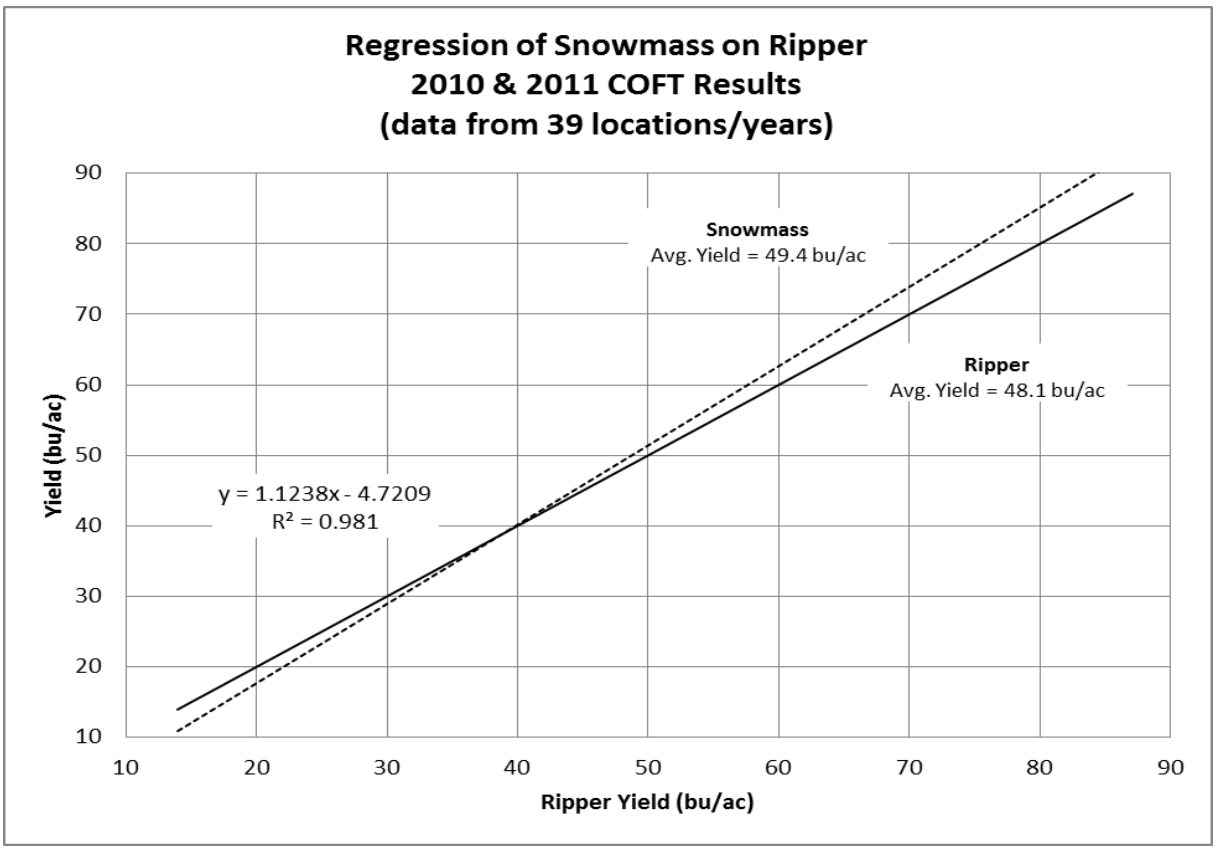

Yield Regression of Ripper on Hatcher
2007-2009, & 2011 COFT Results
(data from 82 locations/years)
Hatcher
Avg. Yield = 42.9 bu/ac
Ripper
Avg. Yield = 41.8 bu/ac
y = 0.9616x + 0.4662
R² = 0.9886
Yield (bu/ac)
Hatcher Yield (bu/ac)
10
20
30
40
50
60
70
80
90

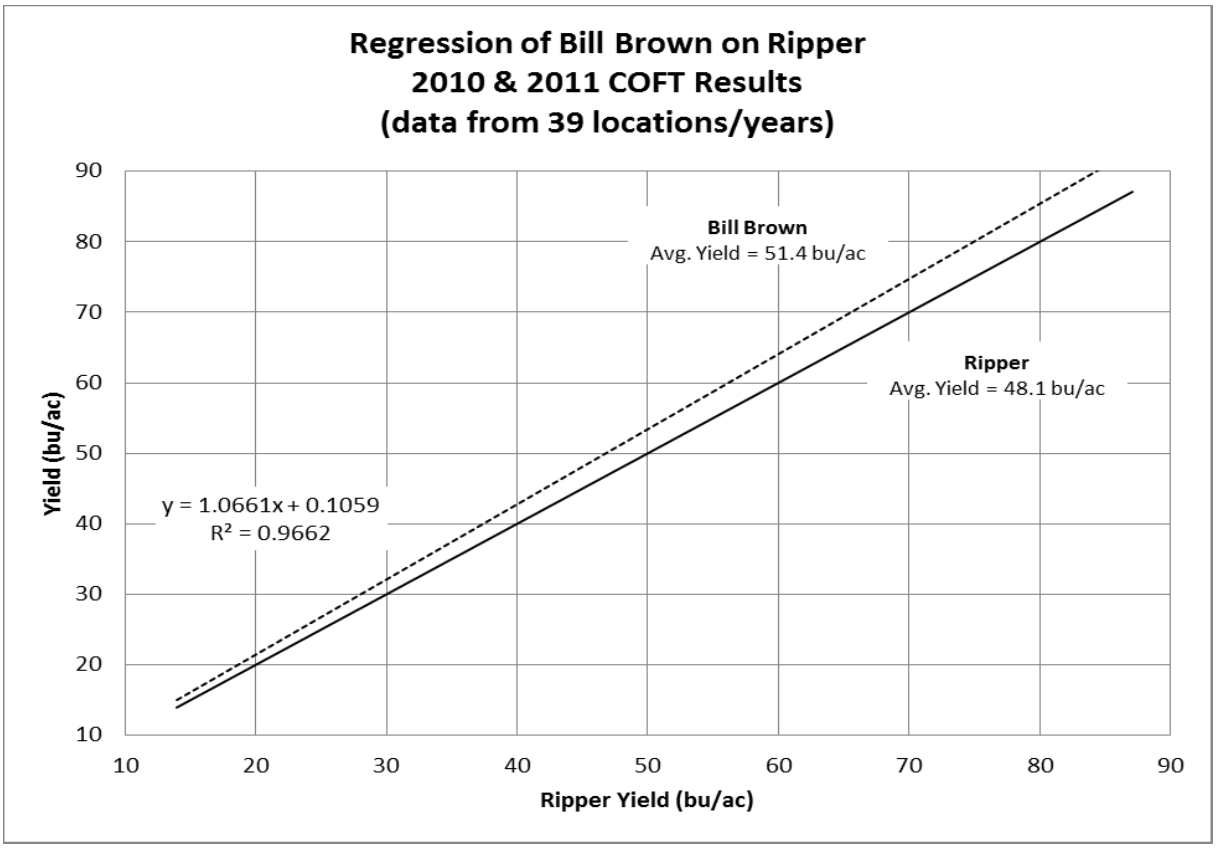

Regression of TAM 112 on Hatcher
2011 COFT Results
(data from 20 locations)
Hatcher
Avg. Yield = 47.2 bu/ac
TAM 112
Avg. Yield = 43.9 bu/ac
y = 1.0505x - 5.7494
R² = 0.9815
Yield (bu/ac)
Hatcher Yield (bu/ac)
10
20
30
40
50
60
70
80
90

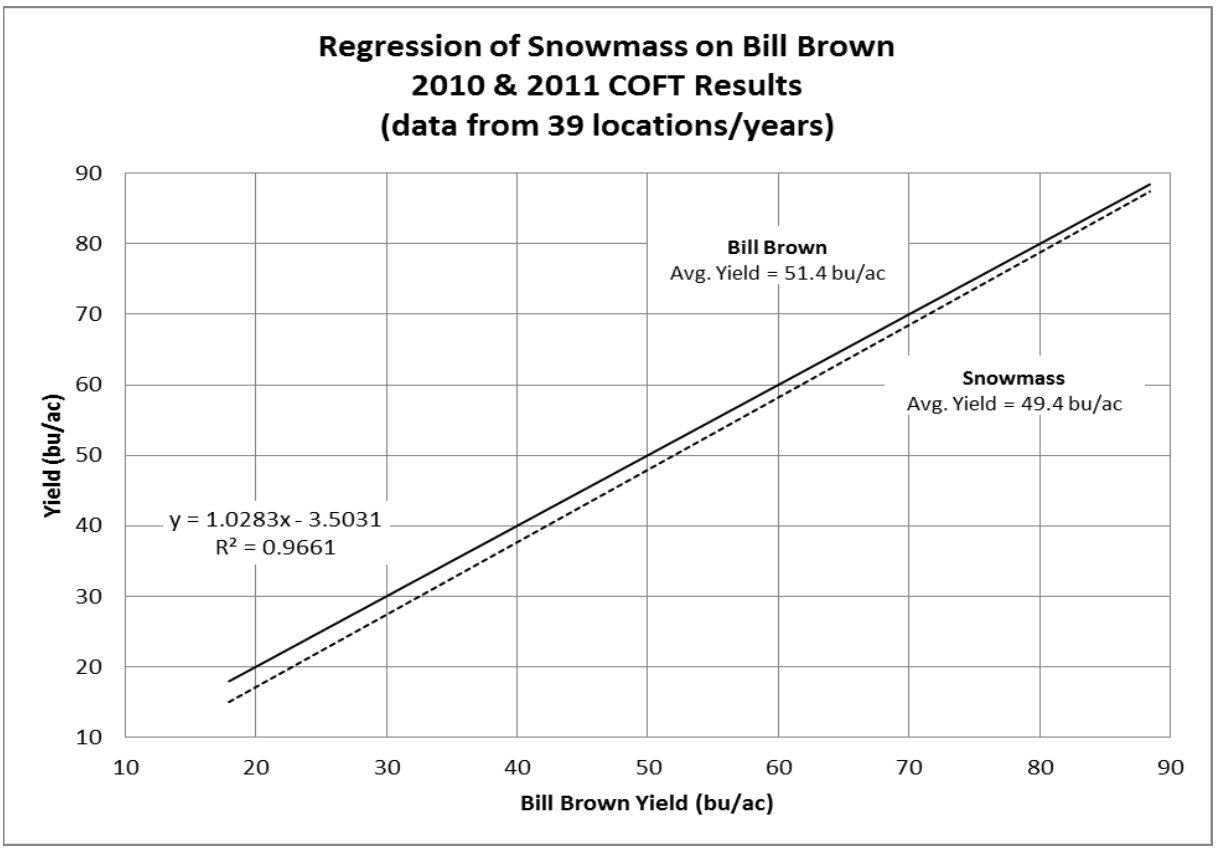

Regression of Bill Brown on Hatcher
2008, 2009, & 2011 COFT Results
(data from 60 locations/years)
Hatcher
Avg. Yield = 41.6 bu/ac
Bill Brown
Avg. Yield = 41.5 bu/ac
y = 1.0024x - 0.1575
R² = 0.9917
Regression lines are stacked on top of each other
Yield (bu/ac)
Hatcher Yield (bu/ac)
10
20
30
40
50
60
70
80
90


Regression of Winterhawk on Hatcher
2011 COFT Results
(data from 20 locations)
Hatcher
Avg. Yield = 47.2 bu/ac
Winterhawk
Avg. Yield = 43.8 bu/ac
y = 1.0303x - 3.9908
R² = 0.9846
Yield (bu/ac)
Hatcher Yield (bu/ac)
10
20
30
40
50
60
70
80
90


Regression of Snowmass on Hatcher
2011 COFT Results
(data from 20 locations)
Hatcher
Avg. Yield = 47.2 bu/ac
Snowmass
Avg. Yield = 44.3 bu/ac
y = 0.9967x - 2.8099
R² = 0.9726
Yield (bu/ac)
Hatcher Yield (bu/ac)
10
20
30
40
50
60
70
80
90


Regression of Snowmass on Ripper
2010 & 2011 COFT Results
(data from 39 locations/years)
Snowmass
Avg. Yield = 49.4 bu/ac
Ripper
Avg. Yield = 48.1 bu/ac
y = 1.1238x - 4.7209
R² = 0.981
Yield (bu/ac)
Ripper Yield (bu/ac)
10
20
30
40
50
60
70
80
90


Regression of Bill Brown on Ripper
2010 & 2011 COFT Results
(data from 39 locations/years)
Bill Brown
Avg. Yield = 51.4 bu/ac
Ripper
Avg. Yield = 48.1 bu/ac
y = 1.0661x + 0.1059
R² = 0.9662
Yield (bu/ac)
Ripper Yield (bu/ac)
10
20
30
40
50
60
70
80
90


Regression of Snowmass on Bill Brown
2010 & 2011 COFT Results
(data from 39 locations/years)
Bill Brown
Avg. Yield = 51.4 bu/ac
Snowmass
Avg. Yield = 49.4 bu/ac
y = 1.0283x - 3.5031
R² = 0.9661
Yield (bu/ac)
Bill Brown Yield (bu/ac)
10
20
30
40
50
60
70
80
90

2011 Irrigated Winter Wheat Variety Performance Trial at Fort Collins

Variety	Yield	Test Weight	Plant Height	Lodging
	bu/ac	lb/bu	in	scale (1-9)[a]
CO050337-2	112.0	60.9	37	4
Hatcher	110.5	60.4	36	2
Robidoux	109.5	61.0	37	3
CO050233-2	108.6	59.5	37	1
Ripper	108.6	59.8	37	3
CO050322	107.8	60.7	36	2
SY Wolf	106.7	60.8	38	2
Duster	106.5	61.5	37	2
CO06424	106.2	60.7	37	3
Settler CL	103.9	61.0	36	2
CO08RWA060	101.9	59.3	38	1
Armour	101.1	60.4	35	2
CO07MAS114	101.0	58.7	36	5
CO05W111	100.4	60.9	39	1
CO050303-2	100.2	61.5	37	2
CO08RWA050	99.4	59.5	37	1
McGill	96.1	60.1	38	1
SY Gold	95.8	60.8	37	1
Bond CL	94.1	60.7	37	2
Yuma	93.8	60.5	36	2
Hitch	92.9	58.6	34	1
Billings	92.3	61.8	37	1
Thunder CL	85.4	60.7	35	1
CO06052	82.2	60.7	38	1
WB-Cedar	69.6	60.3	35	1
Aspen	66.1	60.7	32	1
Average	**98.2**	**60.5**	**36**	**2**
$LSD_{(0.30)}$	5.2			

[a]Lodging scale: 1-no lodging, 9-severe lodging

Harvest date: 7/21/2011
Planting date: 9/10/2010
Cooperators: Colorado State University Wheat Improvement Team (Scott Haley)
Agricultural Research, Development and Education Center (ARDEC)
Previous crop: Summer Fallow
Fertilizer: 70 lb/ac of N and 40 lb/ac of P, fall applied for 125 bu/ac yield goal
Herbicides: 13 oz/ac of Huskie with 17 lb/ac ammonium sulfate in mid-April
Soil: Sandy Clay
Comments: Good fall establishment and growth, timely spring irrigation, leaf rust, stripe rust, and barley yellow dwarf virus all present at low levels. Minor hail damage. Minor lodging of some entries.

2011 Irrigated Winter Wheat Variety Performance Trial at Haxtun

Variety	Yield	Test Weight	Plant Height	Lodging
	bu/ac	lb/bu	in	scale (1-9)[a]
McGill	133.9	62.1	43	3
CO050233-2	133.7	62.0	39	1
Armour	128.8	62.0	35	1
CO08RWA050	128.7	60.5	40	4
CO050322	127.6	62.5	40	6
CO05W111	127.4	62.9	40	2
Hitch	127.0	62.7	38	1
Yuma	125.3	62.4	41	4
SY Wolf	124.8	61.4	37	2
Billings	123.8	63.3	43	5
CO08RWA060	122.9	61.3	44	4
Bond CL	122.5	61.8	39	2
SY Gold	122.3	61.7	38	1
CO050337-2	121.2	62.9	39	7
CO06424	119.7	63.8	41	4
Settler CL	117.8	62.3	40	3
CO050303-2	117.3	62.2	41	6
Hatcher	117.2	61.8	41	5
Duster	116.9	60.9	39	3
Ripper	115.4	61.3	37	2
Robidoux	115.3	64.1	42	4
CO06052	114.5	60.8	40	1
CO07MAS114	112.5	61.0	36	6
Aspen	109.4	56.7	38	1
WB-Cedar	108.4	59.7	37	1
Thunder CL	104.1	62.9	36	2
Average	**120.7**	**61.8**	**39**	**3**
$LSD_{(0.30)}$	6.6			

[a]Lodging scale: 1-no lodging, 9-severe lodging

Harvest date: 7/23/2011
Planting date: 9/28/2011
Cooperator: Steve Meakins
Comments: Planted into good soil moisture. Sandy soil. Trial managed expertly by Crop Quest consultants resulting in very high yields.

2011 Irrigated Winter Wheat Variety Performance Trial at Rocky Ford

Variety	Yield	Test Weight	Plant Height	Lodging
	bu/ac	lb/bu	in	scale (1-9)[a]
CO06424	116.6	61.4	37	4
CO050322	116.0	61.1	37	6
CO05W111	110.2	61.6	39	4
CO050303-2	108.9	59.9	37	3
CO050337-2	107.6	58.8	37	6
Ripper	107.0	59.5	34	2
CO050233-2	106.5	60.6	36	1
Robidoux	106.0	61.9	37	3
Settler CL	105.2	58.9	35	3
Duster	101.7	60.6	37	4
Bond CL	99.7	59.1	37	2
McGill	99.4	60.5	40	4
CO07MAS114	98.5	58.8	36	4
Armour	94.6	60.4	30	1
Aspen	94.1	60.2	30	1
Thunder CL	93.2	61.5	36	2
WB-Cedar	91.4	61.4	29	1
Bill Brown	90.8	58.6	35	3
Billings	90.1	60.3	32	1
SY Wolf	89.7	58.5	36	3
Hitch	89.3	59.3	34	1
CO06052	88.4	60.1	35	1
Hatcher	86.5	60.1	36	4
SY Gold	85.9	58.6	37	2
Yuma	85.0	57.9	35	2
CO08RWA050	82.0	57.5	37	2
CO08RWA060	81.0	56.3	37	3
Average	**97.2**	**59.8**	**35**	**3**
$LSD_{(0.30)}$	4.9			

[a]Lodging scale: 1-no lodging, 9-severe lodging

Harvest date: 7/1/2011
Planting date: 9/22/2010
Cooperator: Arkansas Valley Research Center
Previous crop: Dry beans
Fertilizer: 59 lb/ac of N and 104 lb/ac of P_2O_5
Herbicides: None
Insecticides: None
Soil: Rocky Ford Silty Clay Loam
Comments: Barley yellow dwarf virus, tan spot, leaf and stripe rust, and brown wheat mites were all present but at very low levels.

Summary of 2011 Irrigated Variety Performance Results

Origin[a] and Release Year	Variety[b]	Market Class[c]	Yield[d]	Yield	Test Weight	Height	Heading Date at Ft. Collins	Lodging
			bu/ac	% of avg	lb/bu	in	days from trial avg.	scale 1-9[e]
CSU exp	CO050322	HRW	117.1	111%	61.4	38	2	5
CSU exp	CO050233-2	HRW	116.3	110%	60.7	37	1	1
CSU exp	CO06424	HRW	114.1	108%	62.0	38	-1	4
CSU exp	CO050337-2	HRW	113.6	108%	60.8	38	2	6
CSU exp	CO05W111	**HWW**	112.7	107%	61.8	39	3	2
CSU 2006	Ripper	HRW	110.3	105%	60.2	36	-2	2
NE 2010	Robidoux	HRW	110.3	105%	62.3	39	0	4
NE 2010	McGill	HRW	109.8	104%	60.9	40	1	3
NE 2008	Settler CL	HRW	109.0	103%	60.7	37	2	3
CSU exp	CO050303-2	HRW	108.8	103%	61.2	38	2	4
OK 2006	Duster	HRW	108.4	103%	61.0	38	1	3
WB 2008	Armour	HRW	108.2	103%	60.9	33	-3	1
AP 2011	SY Wolf	HRW	107.1	102%	60.3	37	4	2
CSU 2004	Bond CL	HRW	105.5	100%	60.5	38	-3	2
CSU 2004	Hatcher	HRW	104.7	99%	60.7	38	0	4
CSU exp	CO07MAS114	HRW	104.0	99%	59.5	36	-1	5
CSU exp	CO08RWA050	HRW	103.4	98%	59.1	38	1	2
WB 2008	Hitch	HRW	103.1	98%	60.2	35	2	1
OK 2009	Billings	HRW	102.1	97%	61.8	37	0	2
CSU exp	CO08RWA060	HRW	101.9	97%	59.0	40	1	3
CSU 1991	Yuma	HRW	101.4	96%	60.3	37	-1	3
AP 2010	SY Gold	HRW	101.3	96%	60.3	37	-1	2
CSU exp	CO06052	HRW	95.0	90%	60.5	38	-2	1
CSU 2008	Thunder CL	**HWW**	94.3	89%	61.7	36	0	2
WB 2006	Aspen	**HWW**	89.9	85%	59.2	33	-3	1
WB 2010	WB-Cedar	HRW	89.8	85%	60.5	34	-4	1
		Average	105.5		60.7	37	6/1/2011	3

[a]Variety origin code: CSU=Colorado State University; WB=WestBred (Monsanto); AP=AgriPro (Syngenta); NE=University of Nebraska; OK=Oklahoma State University.

[b]Varieties ranked according to average yield in 2011

[c]Market class: HRW=Hard Red Winter Wheat; **HWW**=Hard White Winter Wheat

[d]2011 average yield and test weight based on three 2011 trials.

[e]Lodging rating: 1-no lodging, 9-fully lodged

Summary of 2-Yr Irrigated Variety Performance Results

Origin[a] and Release Year	Variety[b]	Market Class[c]	2-Yr Average[d] Yield	Yield	Test Weight	Height	Heading Date at Ft. Collins	Lodging
			bu/ac	% of avg	lb/bu	in	days from trial avg.	scale 1-9[e]
CSU exp	CO06424	HRW	103.3	108%	61.9	37	0	5
CSU exp	CO050233-2	HRW	102.1	107%	60.5	36	1	1
CSU exp	CO050322	HRW	102.0	106%	60.7	37	2	5
CSU exp	CO050337-2	HRW	100.0	104%	61.0	38	2	6
NE 2008	Settler CL	HRW	99.1	103%	60.7	36	2	3
CSU exp	CO050303-2	HRW	98.5	103%	61.5	37	2	3
WB 2008	Armour	HRW	97.5	102%	60.8	32	-3	3
CSU exp	CO05W111	**HWW**	97.2	101%	61.4	38	3	3
CSU 2006	Ripper	HRW	96.9	101%	59.7	35	-2	3
OK 2006	Duster	HRW	96.4	101%	61.0	37	0	3
CSU 2004	Bond CL	HRW	96.0	100%	60.5	37	-2	2
OK 2009	Billings	HRW	93.2	97%	61.8	36	0	3
WB 2008	Hitch	HRW	92.8	97%	59.8	34	1	1
CSU 2004	Hatcher	HRW	92.4	96%	60.7	36	0	4
AP 2010	SY Gold	HRW	92.0	96%	60.3	37	-1	2
CSU exp	CO06052	HRW	91.7	96%	61.5	36	-3	1
CSU 1991	Yuma	HRW	91.6	96%	60.2	35	0	3
CSU 2008	Thunder CL	**HWW**	89.7	94%	60.9	35	0	2
WB 2006	Aspen	**HWW**	89.4	93%	59.7	33	-2	1
		Average	95.9		60.8	36	6/1/11	3

[a]Variety origin code: CSU=Colorado State University; WB=WestBred (Monsanto); AP=AgriPro (Syngenta); NE=University of Nebraska; OK=Oklahoma State University.

[b]Varieties ranked according to average 2-yr yield

[c]Market class: HRW=Hard Red Winter Wheat; **HWW**=Hard White Winter Wheat

[d]2-yr average yield and test weight are based on three 2010 trials and three 2011 trials.

[e]Lodging rating: 1-no lodging, 9-fully lodged

Summary of 3-Yr Irrigated Variety Performance Results

Origin[a] and Release Year	Variety[b]	Market Class[c]	3-Yr Average[d] Yield	Yield	Test Weight	Height	Heading Date at Ft. Collins	Lodging
			bu/ac	% of avg	lb/bu	in	days from trial avg.	scale 1-9[e]
NE 2008	Settler CL	HRW	97.6	107%	60.6	37	2	2
WB 2008	Armour	HRW	94.3	104%	59.9	32	-3	2
CSU 2006	Ripper	HRW	93.9	103%	58.8	35	-2	3
CSU 2004	Bond CL	HRW	92.9	102%	59.8	37	-2	2
WB 2008	Hitch	HRW	90.4	99%	59.3	34	1	1
WB 2006	Aspen	**HWW**	90.3	99%	58.9	33	-2	1
CSU 2008	Thunder CL	**HWW**	89.1	98%	59.9	36	0	2
AP 2010	SY Gold	HRW	87.8	97%	59.7	36	-1	2
CSU 2004	Hatcher	HRW	87.0	96%	59.6	36	0	4
CSU 1991	Yuma	HRW	86.3	95%	59.2	35	0	3
		Average	91.0		59.6	35	6/1/11	2

[a]Variety origin code: CSU=Colorado State University; WB=WestBred (Monsanto); AP=AgriPro (Syngenta); NE=University of Nebraska.

[b]Varieties ranked according to average 3-yr yield

[c]Market class: HRW=Hard Red Winter Wheat; **HWW**=Hard White Winter Wheat

[d]3-yr average yield and test weight are based on three trials in 2009, 2010, and 2011.

[e]Lodging rating: 1-no lodging, 9-fully lodged

Winter Wheat Variety Selection in Colorado for Fall 2011

Variety performance summary tables from CSU are intended to provide useful information to farmers, seed producers, and wheat industry representatives in Colorado and surrounding states. This section of the report is designed to provide guidance to farmers so they can weigh the advantages and disadvantages of different varieties and choose the variety that best fits their farm conditions.

- Producers should focus on multiple-year summary yield results when selecting a new variety. Over time, the best buffer against making poor variety decisions has been to select varieties based on three-year average performance and not on performance in a single year. Selection of a variety based upon performance at a single location in a single year has been consistently shown to be the poorest predictor of future yield results.
- Producers should consider planting more than one variety based on different maturity, plant height, disease or insect resistance, test weight, lodging, herbicide tolerance, coleoptile length, or end-use quality characteristics. These non-yield traits are useful to spread your risk due to the unpredictability of climatic conditions and pest problems.
- Producers should be aware that a new race of stripe rust emerged in 2010 and varieties that were resistant before are now susceptible. Although stripe rust was not a problem in 2011, farmers should remain aware of the potential for yield losses due to stripe rust in 2012.
- Producers should control volunteer wheat and weeds to avoid the negative effects of 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 aphids (barley yellow dwarf virus).
- Producers should soil sample to determine optimum fertilizer application rates. In the absence of soil sampling, grain protein levels should be monitored closely. If protein levels in a field fall below 12%, nitrogen fertilizer was likely insufficient to meet demands for yield and yield was lost (consult http://wheat.colostate.edu/Links_files/00544.pdf).

Many new varieties, possessing multiple valuable traits and with high yield potential, are currently in the breeding and selection process. However, the ten dryland wheat varieties emphasized here are based on their order of relative performance for the past three years and the specific traits they possess.

Dryland Production Conditions

Settler CL – This 2008 Nebraska release is a HRW Clearfield* winter wheat that has performed well in 4 years of testing and has good test weight. It is later maturing, medium height, and is moderately susceptible to leaf rust and moderately resistant to stripe rust.

CSU Blend09 – A 50:50 blend of Hatcher and Ripper and first entered into CSU Dryland Variety Trial (UVPT) in 2009.

Snowmass – HWW CSU released in 2009 is a medium-maturing, taller semidwarf with excellent test weight and milling and baking quality. It has excellent resistance to wheat streak mosaic

virus and stripe rust and moderate sprouting tolerance. Snowmass has relatively poor straw strength and will not be recommended for high-yield irrigated conditions. It is being handled in the CWRF ConAgra Mills Ultragrain® Premium Program for hard white wheat (HWW).

Ripper – An early maturing HRW 2006 CSU release that is high yielding, taller than Hatcher, excellent baking quality, and a medium long coleoptile. It has relatively lower test weight, and is susceptible to both leaf and stripe rust. Ripper has shown extremely stable yields, being in the top three of the three year yield averages from 2005 – 2010 and 4th in 2011.

Hatcher – This medium maturing, high yielding 2004 CSU HRW variety was planted on more Colorado wheat acres in the fall of 2008, 2009, and 2010 than any other variety. It has good stress tolerance, good test weight and moderate resistance to stripe rust. Hatcher is also relatively short and develops a "speckling" condition on the leaves in the spring in the absence of any apparent disease. Hatcher remains a highly recommended HRW wheat variety based on its yield record, test weight, stress tolerance, and resistance to stripe rust.

Bill Brown – CSU HRW release (2007) can be compared to Hatcher and Ripper: it is similar in maturity to Hatcher and later maturing than Ripper. Like Ripper it is slightly taller than Hatcher. It has good resistance to stripe rust like Hatcher, which is much better than Ripper, and also very good resistance to leaf rust (unlike Hatcher and Ripper). It has superior test weight to Hatcher and other varieties, especially Ripper (low) and better baking quality than Hatcher but not quite as good as Ripper. Bill Brown is susceptible to stem rust, which is a much greater concern under irrigated conditions. Like Hatcher, Bill Brown tillers aggressively and recovers well from poor stand conditions.

Winterhawk – This WestBred release in 2007 is medium maturing, medium tall, longer coleoptile with good stripe rust resistance. It has good test weight and good baking quality but is susceptible to both leaf and stem rust. It has been high yielding in our variety and COFT trials.

TAM 112 – A HRW 2005 release from Texas A&M and marketed by Watley Seed Company has good dryland adaptation and is distinguished by excellent wheat streak mosaic virus tolerance (or resistance to its vector, the wheat curl mite), a medium-long coleoptile, early maturity, and good test weight and baking quality. It is susceptible to leaf and stripe rust and has poor straw strength.

Above – This CSU Clearfield* HRW (2001) release and both Ripper and TAM 112, are the earliest maturing varieties in the 2011 trials. On a 3-year average, Above is the second highest yielding Clearfield*variety. It has average test weight and is susceptible to leaf and stripe rust and has relatively poor baking quality.

Bond CL – A medium maturing taller 2004 HRW CSU release with high yields and good baking quality in addition to the Clearfield* trait. It has lower test weight and is susceptible to stripe rust.

Irrigated Production Conditions

Four irrigated wheat varieties to consider based on the order of relative performance for three years. The most important variety selection criteria for irrigated varieties are yield, straw strength, and stripe rust resistance.

Settler CL – This 2008 Nebraska release is a HRW Clearfield* winter wheat that has performed well in four years of testing and has good test weight. It is medium height, and is moderately susceptible to leaf rust and moderately resistant to stripe rust.

Armour – A Westbred release (2008) first entered in CSU trials in 2009. Early maturing short semidwarf, with prolific tillering, good leaf and stripe rust resistance, and good straw strength.

Ripper – An early maturing HRW 2006 CSU release that is high yielding and has excellent baking quality. It has relatively lower test weight, and is susceptible to both leaf and stripe rust. Like Bond CL, it may show significant lodging in very high yielding conditions.

Bond CL – A medium maturing taller HRW CSU release (2004) with high yields, average straw strength, but susceptible to stripe rust. It has lodged significantly in some high yielding irrigated trials. It has low test weight that is more manageable and less of a concern in irrigated conditions.

Description of Winter Wheat Varieties in Eastern Colorado Trials (2010 and 2011)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV	TW	MILL	BAKE	Comments
Above Hard red winter TAM 110*4/FS2	CSU-TX 2001	S	4	5	3	9	9	9	5	5	4	7	CSU/Texas A&M release (2001). Clearfield* winter wheat. Early maturing semidwarf, excellent dryland yield in CO. Leaf and stripe rust susceptible. Marginal baking quality.
Armour Hard red winter B1551-WH/KS94U326	Westbred 2008	S	1	1	3	8	1	3	6	7	4	4	Westbred release (2008). Early maturing short semidwarf, heavy tillering, good leaf and stripe rust resistance. Lower test weight.
Aspen Hard white winter TAM 302/B1551W	Westbred 2006	S	3	2	1	8	1	3	5	7	4	6	Westbred release (2006). Hard white winter wheat (HWW), good sprouting tolerance. Short semidwarf, good leaf and stripe rust resistance. Lower test weight.
Bill Brown Hard red winter Yumar/Arlin	CSU 2007	R*	5	3	4	3	4	2	6	2	6	3	CSU release (2007). Good dryland and irrigated yield record in CSU trials. High test weight, good leaf rust resistance, moderate resistance to stripe rust. Very susceptible to stem rust. Good baking quality, short coleoptile.
Billings Hard red winter N566/OK94P597	OK 2009	S	7	4	--	6	2	2	7	8	2	2	Oklahoma State release (2009). First entered into CSU Irrigated Variety Trials in 2010. Good leaf and stripe rust resistance.
Bond CL Hard red winter Yumar//TXGH12588-120*4/FS2	CSU 2004	R*	6	6	5	4	7	6	8	8	6	3	CSU release (2004). Clearfield* winter wheat. Slightly later, slightly taller than Above. Excellent dryland yield in CO, very high irrigated yields, excellent baking quality, lower test weight. Leaf and stripe rust susceptible.
Camelot Hard red winter KS91H184/Arlin SIB//KS91HW29/3/NE82761/Redland/4/VBF0168	NE 2008	S	3	7	7	4	4	2	7	6	4	4	Nebraska release (2008). Medium-early, taller wheat, relatively poor straw strength. Good leaf rust resistance, moderately resistant to stripe rust.
CO050303-2 Hard red winter CO980829/TAM 111	CSU 2011	S	6	7	3	8	1	8	--	2	4	6	CSU experimental, targeted toward fall 2011 release. High dryland and irrigated yields, average milling and baking quality. Medium tall, medium-late, medium coleoptile length. Excellent test weight, good straw strength. Resistant to stripe rust.
CO06052 Hard red winter Teal 11A/Above//CO99314	CSU 2011	S	4	5	2	9	3	6	--	2	4	2	CSU experimental, targeted toward fall 2011 release. Two-gene Clearfield*, excellent milling and baking quality. Early maturity, medium height, medium-long coleoptile. Excellent test weight and straw strength. Moderate resistance to stripe rust.
CO06424 Hard red winter TAM 112/CO970547-7	CSU 2011	S	5	5	4	7	4	6	--	3	3	3	CSU experimental, targeted toward fall 2011 release. High dryland and irrigated yield, excellent quality, medium height, maturity, coleoptile length. Good test weight and straw strength. Moderate resistance to stripe rust, moderate susceptibility to leaf rust.

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.

Description of Winter Wheat Varieties in Eastern Colorado Trials (2010 and 2011)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV	TW	MILL	BAKE	Comments
Danby Hard white winter TREGO/JGR 8W	KSU 2005	S	4	5	4	6	9	6	5	2	3	7	KSU-Hays release (2005). Hard white wheat (HWW), very high test weight. Similar to Trego with improved preharvest sprouting tolerance. Lower baking quality, stripe rust susceptible.
Duster Hard red winter WO405D/HGF112//W7469C/HCF012	OK 2006	S	8	8	3	4	4	2	7	4	6	3	Oklahoma State release (2006). Medium tall, medium late, short coleoptile, leaf rust resistant, moderately resistant to stripe rust.
Everest Hard red winter HBK1064-3/KS84063-9-39-3-4W//VBF0589-1/IL89-6483	KSU 2009	S	5	3	--	7	1	2	7	4	3	8	KSU-Manhattan release (2009). First entered into CSU Variety Trials in 2010. Good leaf and stripe rust resistance. Targeted for production in more eastern portions of the Plains.
Fuller Hard red winter Bulk selection	KSU 2006	S	2	3	7	3	7	2	5	5	5	3	KSU-Manhattan release (2006). Early maturing semidwarf. Average test weight, good leaf rust resistance, stripe rust susceptible. Lower straw strength.
Greer Hard red winter HBK0935-29-15/KS90W077-2-2/VBF0589-1	Agripro 2009	S	5	2	--	9	--	--	--	6	7	5	Agripro release (2009). First entered in CSU Variety Trials in 2011. Medium early, medium short. Lower test weight.
Hatcher Hard red winter Yuma/PI 372129//TAM-200/3/4*Yuma/4/KS91H184/Vista	CSU 2004	R*	6	2	6	6	3	8	8	4	4	3	CSU release (2004). Medium maturing semidwarf. Good test weight, moderate resistance to stripe rust. Excellent dryland yield across the High Plains, good milling and baking quality. Develops “leaf speckling” condition.
Hawken Hard red winter Rowdy/W96-427	Agripro 2006	S	2	2	2	2	8	2	8	4	5	3	Agripro release (2006). Medium maturing, short semidwarf. Good leaf rust resistance, stripe rust susceptible, good straw strength.
Hitch Hard red winter 53/3/ABL/1113//K92/4/JAG/5/KS89180B	Westbred 2008	S	6	2	2	4	7	2	7	4	8	6	Westbred release (2008). Positioned for High Plains irrigated production. Good straw strength, good leaf rust resistance, stripe rust susceptible, lower milling and baking quality.
Infinity CL Hard red winter Windstar/3/NE94481//TXGH125888-120*4/FS2	NE 2004	S	5	7	6	6	3	3	6	4	5	5	Nebraska release (2005). Clearfield* winter wheat. Medium maturing, taller wheat, moderate resistance to stripe rust. Improved baking quality relative to Above. Develops “leaf speckling” similar to Hatcher.
Jagalene Hard red winter Abilene/Jagger	Agripro 2001	S	5	5	5	3	9	9	4	3	2	4	Agripro release (2001). Good test weight, good wheat streak mosaic virus tolerance. Observed to shatter in CO and KS trials. Leaf and stripe rust susceptible.

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.

Description of Winter Wheat Varieties in Eastern Colorado Trials (2010 and 2011)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV	TW	MILL	BAKE	Comments
Jagger Hard red winter KS82W418/Stephens	KSU 1994	S	3	5	5	2	8	9	4	5	4	4	KSU-Manhattan release (1994). Early maturing semidwarf, good baking quality, good WSMV tolerance, very leaf and stripe rust susceptible. Breaks dormancy very early in the spring.
Keota Hard red winter Custer/Jagger	Westbred 2005	S	5	6	5	6	7	8	8	6	3	5	Westbred release (2005). Leaf and stripe rust susceptible. Taller plant stature, maintains height under stress.
McGill Hard red winter NE92458/Ike	NE 2010	S	6	6	--	1	--	--	--	8	6	4	Nebraska release (2010). First entered in CSU Variety Trials in 2011. Medium maturity, medium height. Low test weight.
Prairie Red Hard red winter CO850034/PI372129//5*TAM 107	CSU 1998	R*	4	3	3	8	8	9	5	6	4	7	CSU release (1998). Backcross derivative of TAM 107, resistant to RWA biotype 1. Good stress tolerance, poor end-use quality reputation, lower yields relative to more recent wheat releases. Leaf and stripe rust susceptible.
Protection Hard red winter Jagger//TXGH12588-120*4/FS2	AGSECO/CSU 2004	S	3	7	3	4	7	9	4	8	4	7	CSU release (2004), marketed by AGSECO. Clearfield* winter wheat. Lower yield relative to Bond CL in CSU Variety Trials in 2003 and 2004. Taller plant stature, moderate susceptibility to stripe rust.
Ripper Hard red winter CO940606/TAM107R-2	CSU 2006	R*	2	4	4	9	9	9	7	7	3	3	CSU release (2006). Excellent stress tolerance, high dryland yields in Colorado, excellent milling and baking quality. Very good recovery from stand reduction. Leaf and stripe rust susceptible, lower test weights.
Robidoux Hard red winter NE96644/Wahoo (sib)	NE 2010	S	5	2	--	7	--	--	--	4	7	5	Nebraska release (2010). First entered in CSU Variety Trials in 2011. Medium maturity, medium short.
Settler CL Hard red winter N95L164/3/MILLENNIUM SIB//TXGH125888-120*4/FS2	NE 2008	S	8	5	3	5	4	8	7	4	3	4	Nebraska release (2008). Clearfield* winter wheat. Excellent dryland and irrigated yield in CSU Variety Trials. Later maturing, medium height. Moderately susceptible to leaf rust, moderately resistance to stripe rust.
Smoky Hill Hard red winter 97 8/64 MASA	Westbred 2006	S	6	3	4	5	8	2	8	5	5	2	Westbred release (2006). Medium late, shorter semidwarf. Good leaf rust resistance, stripe rust susceptible, good baking quality.
Snowmass Hard white winter KS96HW94//Trego/CO960293	CSU 2009	S	7	6	8	5	2	5	2	4	5	3	CSU release (2009). Hard white winter wheat (HWW). Medium-maturing, taller semidwarf. Good resistance to wheat streak mosaic virus and stem and stripe rust, moderate sprouting tolerance. Grown under contract with ConAgra.

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.

Description of Winter Wheat Varieties in Eastern Colorado Trials (2010 and 2011)

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL**	YR	LR	WSMV	TW	MILL	BAKE	Comments
SY Gold Hard red winter W95-301/W98-151	Agripro 2009	S	4	5	5	2	7	3	--	3	5	5	Agripro release (2009). First tested in CSU trials in 2009. Good leaf rust resistance, susceptible to stripe rust. Good milling quality, lower baking quality.
T163 Hard red winter 93WGRC27/T811	Trio 2010	S	3	4	--	4	--	--	--	6	5	7	Trio (Limagrain) release (2010). First entered in CSU Variety Trials in 2011.
TAM 111 Hard red winter TAM-107//TX78V3630/CTK78/3/TX87V1233	TX 2002	S	6	7	3	8	1	8	5	2	4	5	Texas A&M release (2002), marketed by Agripro. Medium maturing, taller wheat. Good test weight, good straw strength, good irrigated yield. Leaf rust susceptible, very good stripe rust resistance.
TAM 112 Hard red winter U1254-7-9-2-1/TXGH10440	TX 2005	S	2	4	7	7	7	9	2	2	4	2	Texas A&M release (2005), marketed by Watley Seed. Good test weight, good quality, excellent wheat streak mosaic virus tolerance. Susceptible to leaf and stripe rust, poor straw strength.
Thunder CL Hard white winter KS01-5539/CO99W165	CSU 2008	R*	4	4	3	7	3	5	4	4	5	2	CSU release (2008). Hard white Clearfield* wheat. Good straw strength, high yields under irrigation. Excellent quality, moderate resistance to stripe rust and wheat streak mosaic virus, moderate sprout susceptibility. Grown under contract with ConAgra.
WB-Cedar Hard red winter TAM 302/B1551W	Westbred 2010	S	--	--	--	7	--	--	--	--	4	6	Westbred release (2010). First entered in CSU Variety Trials in 2011. Hard red sister selection to Aspen hard white wheat.
WB-Stout Hard red winter KS94U275/1878//Jagger	Westbred 2009	S	1	3	5	4	8	2	4	8	8	3	Westbred release (2009). First tested in CSU trials in 2010. Good leaf rust resistance, stripe rust susceptible, lower test weight.
Winterhawk Hard red winter 474S10-1/X87807-26//HBK0736-3	Westbred 2007	S	5	5	5	8	2	8	5	2	2	4	Westbred release (2007). Medium maturing, medium tall, longer coleoptile. Good stripe rust resistance, susceptible to leaf rust, very susceptible to stem rust. Good test weight, good quality.
Wolf Hard red winter W99-331/97x0906-8	Agripro 2011	S	6	4	--	5	6	4	--	4	2	7	Agripro release (2011). First entered in CSU Variety Trials in 2011. Good milling quality, poor baking quality. Good resistance to tan spot and septoria, moderately susceptible to stripe rust, moderately resistant to leaf rust.
Yuma Hard red winter NS14/NS25//2*Vona	CSU 1991	S	6	3	3	1	5	5	6	6	5	4	CSU release (1991). Medium maturity, semidwarf, short coleoptile, good baking quality characteristics. Moderate resistance to stripe rust. Good yields especially under irrigation.

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.

Wheat Stem Sawfly: A New Pest of Colorado Wheat

Ben Irell and Frank Peairs
Department of Bioagricultural Sciences and Pest Management
Colorado State University

The wheat stem sawfly is a native grass-feeding insect that has long been a threat to spring wheat production in the northern plains. In the early 1980s, however, it emerged as a significant pest of winter wheat as well. Since then, sawfly infestations in winter wheat have spread from North Dakota and Montana into southeastern Wyoming, the Nebraska Panhandle, and, most recently, northeastern Colorado. Damage to winter wheat was first reported in Colorado in 2010, from areas along Highway 14 in Weld County.

Identification/ Life Cycle

The wheat stem sawfly has one generation per year. Adults emerge in late May or early June and are generally active when winds are calm and field temperatures are above 50° F. The adult wheat stem sawfly is about ¾ of an inch long with smoky-brown wings. It is wasplike in appearance, with a shiny black body with three yellow bands around the abdomen. When not in flight they often on found on wheat stems, positioned with the head pointed downward.

Figure 1: Wheat stem sawfly adult. Image courtesy of J. Kalisch, Department of Entomology, University of Nebraska.

Females lay eggs immediately upon emergence and typically live about 1 week. The adult emergence and flight period continues for 3-6 weeks. They are not strong fliers and usually only fly until they find the nearest wheat field or other suitable host grasses. In wheat, this often results in more serious problems occurring at the field margins closest to the adult emergence site which is the previous year's wheat field. They preferentially select the largest wheat stems available and insert eggs into the first available internode or when a stem is fully developed, below the uppermost node. If sawflies are abundant, eggs may be laid in smaller stems, and multiple eggs may be laid in a single stem. However, only one larva will survive in each stem due to cannibalism. Females lay an average of 30-50 eggs, depending on the size of available host stems. Eggs are difficult to detect because they occur inside the stem.

Figure 2: Wheat stem sawfly larva in stem. Image courtesy of the Department of Entomology, University of Nebraska.

Sawfly larvae are always found within the stem and will assume an S-shaped position when taken out of the stem. They move slowly down the stem as they feed, for approximately 30 days. Sawfly larvae are cream colored, have a broad head, and are ½ to ¾ of an inch in length when fully grown. When they are mature they move down towards soil level and cut a V-shaped notch around the interior of the stem. They then seal the interior of the stem just below the notch with frass and move down near the crown. The upper stem often breaks at this weakened notch just prior to harvest, and the remaining stem containing the overwintering chamber is referred to as the "stub". The larvae overwinter in the stubs, slightly below soil level, before pupating in early spring. They produce a clear protective

covering that protects them from excess moisture and moisture loss.
Host Plants and Damage:

The wheat stem sawfly has traditionally infested spring wheat, but over the last few decades the damage is becoming increasingly common in winter wheat. It also feeds in several hollow-stemmed noncultivated grasses, including quackgrass, smooth brome and various wheatgrasses. It does not attack corn or broad leaf crops. Although the sawfly may lay eggs in other cereals, including barley, oat, and rye, larvae rarely mature in barley and rye and do not survive in oat.

Firgure 3: Wheat stems cut by the wheat stem sawfly. Image courtesy of the Department of Entomology, University of Nebraska.

Darkened areas on the stem, just beneath the node, indicate larval infestation. To verify the presence of the sawfly in a suspected plant, split the stem from top to bottom. A stem filled with a sawdust-like substance indicates feeding activity. The larva will most likely be located in a chamber within the stem, just above the crown.

The most visible wheat stem sawfly damage is stem breakage or lodging just prior to harvest. The stem is greatly weakened by the groove the larva cuts around the base of the plant. Lodging becomes more obvious as harvest approaches and results in yield loss of five to ten percent due to unrecoverable wheat heads because the combine cannot pick up the lodged stems. In addition, physiological damage caused by feeding activity results in yield losses of ten to twenty percent in infested heads that are harvested.

Management

Cultural Controls

Tillage reduces wheat stem sawfly survival, however, its impact on overall sawfly abundance and on damage to the next wheat crop is variable. Shallow tillage after harvest lifts the crowns and loosens the soil around them. This maximizes the larvae's exposure to the late summer dryness and winter cold, increasing mortality. Intense tillage that buries stubble also reduces sawfly survival, but to a lesser degree. Intense tillage may interfere with important biological control agents and will increase the risk of soil erosion. No-till has been linked to many of the recent wheat stem sawfly problems in the region. However, the advantages of controlling the sawfly with tillage must be weighed against the considerable benefits of no-till.

Planting attractive varieties of trap crops such as barley, oat or rye along the edge of wheat fields may be effective in decreasing damage and reducing the number of sawflies the following year. The sawflies will oviposit in the trap crop, but the larvae will be unable to complete development. This method is especially effective when the sawfly abundance is low to moderate and significant infestations are limited to the field margins. However, when sawflies are abundant, females may move past the trap crop and into the wheat to oviposit, resulting in significant damage.

Planting wheat in larger blocks as opposed to narrow strips is another cultural practice that may reduce sawfly damage potential. This minimizes the amount of field border adjacent to stubble where sawfly adults will be emerging, and thus, the part of the field most vulnerable to infestation. Sawflies are not strong fliers and tend to fly only until they reach a stem that is suitable for egg laying, which is the basis for this practice. Though the soil erosion benefits of planting in narrow strips may be reduced, larger fields are still a viable option if erosion is addressed by no-till practices.

Resistant Wheat Varieties

Solid stem varieties of wheat have been shown to be effective in reducing damage caused by the wheat stem sawfly. The availability of several adapted solid-stemmed wheat cultivars provides a viable management option for parts of the northern High Plains. In areas where the sawfly is a recent arrival, wheat breeding programs are beginning to focus on incorporation of the solid stem characteristic into adapted varieties, using both conventional selection and linked DNA markers. The program at Colorado State University also is initiating long term research into novel methods for making the wheat plant less attractive to the sawfly.

Biological Control

Several parasitic wasps attack wheat stem sawfly in the northern plains, and these are thought to be important mortality factors. The presence and effectiveness of natural enemies in Colorado has not been determined.

Chemical Control

Currently available insecticides are ineffective and cost-prohibitive. The most promising strategy seems to be control of adults to prevent egg laying. However, the prolonged flight period likely would require repeated treatments and there is no evidence for the effectiveness of this approach. Using solid-stemmed cultivars and cultural controls are currently the most effective alternatives.

CSU Wheat Breeding and Genetics Program Update June 2011

Scott Haley, CSU Wheat Breeder

Introduction

The primary goal of the CSU Wheat Breeding and Genetics Program is to develop and release improved wheat cultivars and germplasm adapted for the diverse production conditions in Colorado and the High Plains. In over 50 years of continuous wheat improvement at CSU, we have developed a uniquely adapted germplasm base and have brought many new cultivars to the market to address production and marketing constraints facing Colorado's wheat producers. We are fortunate to receive generous funding support from CSU (Colorado Ag Experiment Station) and from the Colorado wheat industry through the Colorado Wheat Administrative Committee (CWAC) and the Colorado Wheat Research Foundation (CWRF). The funding we receive, enhanced considerably with the CWAC assessment increase in 2007, supports several different activities focused on wheat cultivar development. The following descriptions of these activities highlight our progress over the last few years, particularly since the CWAC assessment increase in 2007.

Breeding Program Core

The primary goal of our breeding program is the development and release of improved wheat cultivars adapted for Colorado and the High Plains region. Funding provided by CWAC is used for partial salary/benefits for two research associates (4 months for one, 1 month for another) and general program support (supplies, temporary labor, travel). The Colorado Ag Experiment Station provides funding (8 months) to our program for a full-time research associate for greenhouse management.

- For the 2010-11 season, we have over 17,000 yield trial plots scattered across 14 field locations in Colorado. In addition to yield trials, we have over 35,000 F4 and F5 generation headrows, nearly 1,000 early-generation (F2-F4) populations, and over 1,500 new cross combinations planted at Fort Collins in 2010-11.
- Snowmass HWW was released in fall 2009. Snowmass has yielded very well in three years of dryland variety trial testing (2008-10) and, together with Thunder CL HWW (released in 2008), has generated considerable interest through the CWRF ConAgra Mills Ultragrain® Premium Program.
- Three HRW experimental lines are currently on foundation seed increase for possible release in 2011. These include CO06424, CO050303-2, and CO06052 (2-gene Clearfield*, for enhanced feral rye control). All three lines have shown high yield in field trials, good test weight, and good stripe rust resistance. Two of the lines (CO06424 and CO06052) have exceptional milling and baking quality. If released, CO06052 would be the first publicly-developed 2-gene Clearfield* winter wheat.
- In 2010 we engaged in collaborations to: transfer novel third-party, non-GM-derived traits to our breeding program (high amylose, high biomass); strengthen collaborations with Kansas State and Oklahoma State Universities; and develop methodologies for field-based assessment of nitrogen use efficiency (NUE) (in collaboration with the USDA-ARS at Akron, CO).

Drought Stress Tolerance

The basic objective of this effort is to develop a "pre-breeding capacity" focused on transferring drought stress tolerance traits from exotic or unadapted germplasm into adapted CSU germplasm. Funding provided by CWAC is used for salary/benefits support for a PhD-level research scientist and general research support (supplies, temporary labor, travel).

- In 2010-11, the third year of a drought tolerance study will be completed at the USDA-ARS Limited Irrigation Research Farm in Greeley, CO. Twenty-four winter wheat experimental lines and cultivars with a range of drought stress responses were planted under five drip-irrigation treatments to gain a better understanding of the stress tolerance mechanisms in our germplasm. Remote sensing for rapid assessment of early growth has shown a good correlation with early biomass development and is now being used for breeding line evaluation. Digital imagery has also proven useful for growth assessment.
- We have increased our use of "synthetic wheats" for enhanced drought stress tolerance. We are using synthetic wheats derived at the International Wheat and Maize Improvement Center (CIMMYT) in Mexico by crossing durum wheat with wild wheat, thus expanding the range of genetic variability available for use in wheat breeding. Ninety synthetic wheat populations were obtained from Texas A&M University in fall 2008. About 100 selections were made from these populations in 2010 and are being evaluated in yield trials at Walsh and Sheridan Lake in 2010-11. A second group of populations developed with a new set of synthetics were planted in early spring 2011. Pat Byrne is also co-lead of a USDA-funded project focusing on developing a knowledge base to more effectively exploit synthetic wheat germplasm.
- Each year since 2008, we have conducted side-by-side full/reduced irrigation evaluations of germplasm collections at ARDEC in Fort Collins. Materials originate from the hard winter wheat region and international trials coordinated by CIMMYT in Turkey. This effort has proven useful in identifying new drought stress tolerant germplasm for use in our crossing program.
- Populations have been developed to enable DNA marker mapping of several novel semi-dwarfing genes. These genes reportedly confer a longer coleoptile and enhanced early growth characteristics under stress and deep planting relative to conventional sources of semi-dwarfism. The populations have been characterized and marker assays will be done in fall 2011.
- Under Pat Byrne's leadership, we received a Beachell-Borlaug grant to fund a PhD graduate student to focus on "association mapping" for drought stress tolerance. Pat Byrne is leading our involvement in a new $25 million USDA-funded project entitled "Improving Barley and Wheat Germplasm for Changing Environments", with our involvement focusing on drought stress tolerance in a winter wheat association mapping panel.

DNA Marker-Assisted Selection

The core of this effort involves application of DNA molecular marker-assisted selection (MAS) in a rapid generation advance scheme called "single seed descent" (SSD) that will allow us to rapidly develop experimental lines with desired trait combinations. We are also working to identify new DNA markers for traits of interest in our breeding program. Funding provided by CWAC is used for salary/benefits for a MS-level research associate and laboratory supplies and reagents.

- Each spring since 2008 we have initiated SSD with 30-50 different cross populations. Each set is assayed for key DNA markers during the first generation in the greenhouse and then two subsequent generations are advanced in the greenhouse. Experimental lines from the first set in spring 2008 are in yield trials in 2010-11. Approximately 1/8 of the 1,200 experimental lines at this stage of the program in 2011 were developed via SSD with DNA marker-assisted selection.
- In addition to our efforts with SSD, in 2010-11 we have also committed to have 1,000 doubled haploid lines (costing $30/line) made for us by the Heartland Plant Innovation Center (HPI) in Manhattan, KS. Doubled haploids are "true-breeding" lines developed in a one-two years time frame rather than the four-five year time frame with conventional breeding methods. We hope to continue to use this service as our budget allows. The CWRF royalties that are returned to our program are used for this purpose.
- We routinely use DNA markers for rapid transfer of unique traits from unadapted germplasm. We have focused on the following: leaf, stripe, and Ug-99 stem rust resistance; wheat streak mosaic virus resistance; gluten strength; polyphenol oxidase (PPO) content; pre-harvest sprouting.
- We have identified novel DNA markers linked to the wheat streak mosaic virus resistance gene in Snowmass HWW (in collaboration with Texas A&M University) and a gene for RWA resistance identified in an Iranian landrace selection. We are also in the third year of a collaboration with Australian researchers to identify DNA markers for Russian wheat aphid (RWA) resistance in several mapping populations.
- We are pursuing implementation of a breeding method known as "genomic selection". This novel method utilizes advances in DNA sequencing and bioinformatics tools to potentially lead to more rapid yield gains in wheat breeding. A PhD-level graduate student is currently working on this project from the standpoint of nitrogen use efficiency (NUE) enhancement.

TILLING for Novel Trait Development

TILLING (Targeting Induced Local Lesions In Genomes) is a novel technique that uses a combination of chemical mutagens and advanced genomics to identify useful plant mutations. The objective of this project is to identify useful novel, non-GM traits for potential deployment in wheat cultivars for Colorado. Funding provided by CWAC is used for laboratory supplies and salary/benefits for a PhD level scientist that focuses on TILLING mutant identification (under the leadership of Nora Lapitan) and a MS-level research associate focusing on novel trait validation and transfer to our breeding materials.

- A mutagenized population of Hatcher has been generated using the mutagen ethyl methyl sulfonate (EMS), which creates single-base changes in DNA. A total of 3000 mutagenized plants have been isolated in two rounds of chemical mutagenesis. A second mutagenized population, in a spring wheat background, has been obtained from Univ. California-Davis.
- A reliable working protocol for TILLING mutant screening has been developed. We have explored different methods of mutant detection to optimize our procedures and plan to purchase a new DNA fragment analyzer (using funding from CWRF) that will greatly streamline the process.
- Using virus-induced gene silencing (VIGS), we confirmed the role of a candidate gene in conferring enhanced drought stress tolerance in wheat. Using bioinformatic tools and sequence information from rice and barley, we have identified 15 wheat plants (all three

genomes) that carry a mutation in this gene. Crosses with these plants are being made in the breeding program for trait validation and potential trait deployment.
- A second drought-related gene has been identified as a potential target for TILLING. Bioinformatic tools described above have been used to identify TILLING mutants in this gene in wheat. We have identified mutants in two of wheat's genomes and are conducting research on the third genome.
- Candidate genes for other useful traits (drought stress tolerance, insect resistance, herbicide tolerance) have been identified and will be used in TILLING and conventional mutant identification (where possible) to identify wheat plants carrying mutations in these genes.

Russian Wheat Aphid Resistance

Our efforts in this area have focused on identification of germplasm resistant to the new RWA biotypes and rapid transfer of the resistance to adapted backgrounds via backcross and forward breeding. Our program, in close collaboration with Frank Peairs, has also focused on identification of molecular DNA markers linked with different resistance genes for use in marker-assisted selection (MAS). Funding provided by CWAC is used for partial salary/benefits (8 months) for one research associate with the remaining 4 months funded by the Colorado Ag Experiment Station RWA project.

- Four experimental lines with RWA biotype 2 resistance are in the state dryland variety trial (UVPT) in 2010-11. Pending trial results, one or more of these lines may be moved toward seed increase for potential release in 2012. Because the resistance in these lines is from the rye-derived Dn7 gene, we are concerned about the quality of the lines (additional tests are being done).
- In spring 2010, we confirmed that our efforts to separate the negative quality effects from the Dn7 gene were successful. Backcross-derived lines with this resistance in a Bill Brown background are being increased in the field in spring 2011 to enable preliminary yield tests in 2012.
- In 2010, 36 line selections in a Snowmass background were advanced for yield trials in 2010-11. Two different sources of RWA biotype 2 resistance (PI 572652 and PI 626580) were used to develop these materials. A limited number of these lines will be advanced for further testing in the CSU Elite Trial in 2012.

End-Use Quality Improvement

The primary goals of this effort are to conduct milling and baking quality evaluations on experimental lines in our breeding program and samples collected from the state dryland (UVPT) and irrigated (IVPT) variety trials. Our overall strategy in breeding line evaluation is to identify lines with unacceptable quality early in the breeding process (so that they may be discarded) and identify superior quality lines so that they may be properly positioned for a ConAgra-type, identity-preserved program. Funding provided by CWAC is used for temporary labor (student and non-student hourly) and for repair and maintenance of equipment in the laboratory. The Colorado Ag Experiment Station provides funding (11 months) to our program for a full-time research associate for wheat quality lab management during the winter months.

- Comprehensive milling and baking quality evaluations are done on selected locations of the state dryland (UVPT) and irrigated (IVPT) variety trial program every year. Since 2007, data and interpretations from these evaluations have been reported in the Making Better

Decisions booklet to assist producers in the variety selection process.

- Comprehensive milling and baking quality evaluations are done annually at several different stages of our breeding program. We are currently testing entries each year from four locations of the CSU Elite Trial, two locations of the Advanced Yield Nursery, and a single location of the Preliminary Yield Nursery. Each year we do over 2,000 single kernel characterization system (SKCS) tests, over 2,000 Mixographs, over 600 polyphenol oxidase (PPO) assays, and over 600 full-scale Quadrumat Senior milling and pup-loaf bake tests.
- Through our federal special research grant, we have developed and implemented several calibrations for rapid end-use quality prediction using near-infrared reflectance spectroscopy (NIRs).

Wheat Planting Rates

Planting seeds per acre instead of pounds per acre

Jerry Johnson

I have been preaching at wheat field days and wheat planting decision meetings for fifteen years that farmers should be planting seeds per acre instead of plants per acre due to the potentially large difference in seed size among variety seed lots. It is not uncommon to have some seed lots with 10,000 seeds per pound or 18,000 seeds per pound. A farmer planting 35 pounds per acre could be planting 350,000 seeds per acre or 630,000 seeds per acre. The date of planting influences the recommended seeding rate – lower seeding rates if seeding in early September and higher seeding rates if seeding in October.

I recommend seeding 350,000 seeds per acre in in early September so you don't have too many tillers develop before winter, which can lead to more tillers than can be filled in the case of winter or spring drought. If seeding conditions are good when planting early September, i.e. good soil moisture, then 350,000 seeds per acre should be sufficient. If 'dusting in' the seed in early September, or if you are planting down to moisture, then you might want to go as high as 500,000 seeds per acre. If you are seeding under good soil moisture conditions in mid-September then I would recommend planting 700,000 seeds per acre. This is the seeding rate we use for our variety trials and it has proven to be a good average seeding rate over locations and in different years. If conditions are not very good in mid-September (dry or planting down to moisture) then you should increase your seeding rate. If planting in late October, or even into November, then you want to significantly increase the seeding rate to a million or more seeds per acre.

If you want to plant:

350,000 seeds per acre on 7.5" rows you need to plant 5 seeds per linear foot.
350,000 seeds per acre on 10" rows you need to plant 6.5 seeds per linear foot.
350,000 seeds per acre on 12" rows you need to plant 8 seeds per linear foot.

700,000 seeds per acre on 7.5" rows you need to plant 10 seeds per linear foot.
700,000 seeds per acre on 10" rows you need to plant 13 seeds per linear foot.
700,000 seeds per acre on 12" rows you need to plant 16 seeds per linear foot.

1,050,000 seeds per acre on 7.5" rows you need to plant 15 seeds per linear foot.
1,050,000 seeds per acre on 10" rows you need to plant 20 seeds per linear foot.
1,050,000 seeds per acre on 12" rows you need to plant 24 seeds per linear foot.

After emergence you can take stand counts and determine what percent emerged in your field. I am often surprised when I take stand counts after planting as they turn out to be much lower than expected – even under seemingly good planting conditions.

Wheat Information Resources

Dr. Jerry Johnson - Associate Professor/Extension Specialist - Crop Production, Colorado State University, Department of Soil and Crop Sciences, C12 Plant Science Building, Fort Collins, CO 80523-1170, phone: 970-491-1454, fax: 970-491-2758, e-mail: jerry.johnson@colostate.edu.

Dr. Scott Haley - Professor/Wheat Breeder, Colorado State University, Department of Soil and Crop Sciences, C136 Plant Science Building, Fort Collins, CO 80523-1170, phone: 970-491-6483, fax: 970-491-0564, e-mail: scott.haley@colostate.edu.

Dr. Jessica Davis - Professor/Extension Specialist/Soils, Colorado State University, Department of Soil and Crop Sciences, C09 Plant Science Building, Fort Collins, CO 80523-1170, phone: 970-491-1913, fax: 970-491-2758, e-mail: jessica.davis@colostate.edu.

Brad Erker - Director of Colorado Seed Programs, Colorado State University, Department of Soil and Crop Sciences, C143 Plant Science Building, Fort Collins, CO 80523, phone: 970-491-6202, e-mail: brad.erker@colostate.edu.

Darrell Hanavan - Executive Director of the Colorado Wheat Administrative Committee/Colorado Association of Wheat Growers/Colorado Wheat Research Foundation, 4026 South Timberline Road, Suite 100, Fort Collins CO 80525, phone: 970-449-6994, toll free: 1-800-WHEAT-10, fax: 970-449-6999, e-mail: dhanavan@coloradowheat.org.

Dr. Frank Peairs - Professor/Extension Specialist/Entomologist, Colorado State University, Department of Bioagricultural Sciences & Pest Management, 102 Insectary, Fort Collins, CO 80523-1177, phone: 970-491-5945, fax: 970-491-6990, e-mail: frank.peairs@colostate.edu.

Dr. Ned Tisserat - Professor/Plant Disease Specialist, Colorado State University, Department of Bioagricultural Sciences & Pest Management, C137 Plant Science Building, Fort Collins, CO 80523-1177, phone: 970-491-6527, fax: 970-491-3862, e-mail: ned.tisserat@colostate.edu

Thia Walker - Extension Specialist - Pesticide Education, Colorado State University, 1177 Campus Delivery, Fort Collins, CO 80523-1177, phone: (970) 491-6027, fax: (970) 491-3888, e-mail: thia.walker@colostate.edu.

Dr. Phil Westra - Professor/Extension Specialist/Weed Science, Colorado State University, Department of Bioagricultural Sciences & Pest Management, 112 Weed Research Lab, Fort Collins, CO 80523-1177, phone: 970-491-5219, fax: 970-491-3862, e-mail: philip.westra@colostate.edu.

Additional Wheat Information Resources on the Web
http://www.csucrops.com- Colorado State University Crop Variety Testing Program
http://wheat.colostate.edu - Colorado State University Wheat Breeding Program
http://wheat.colostate.edu/vpt.html - Colorado Wheat Variety Performance Database (CSU Wheat Breeding Program).
http://www.coloradowheat.org - Colorado Wheat Administrative Committee (CWAC), Colorado Association of Wheat Growers (CAWG), and Colorado Wheat Research Foundation (CWRF) website.

Acknowledgments

The authors are grateful for support received from Colorado State University and for the funding received from the Colorado Wheat Administrative Committee and the Colorado Wheat Research Foundation. The Colorado Wheat Administrative Committee provides substantial financial support to Colorado State University for wheat breeding and wheat-related research.

We are thankful to Kierra Jewell (CSU Extension); Jim Hain and Sally Sauer (Crops Testing); John Stromberger, Emily Heaton, Rebecca Kottke, Scott Seifert, Victoria Valdez, and Marc Moragues (Wheat Breeding Program); Chris Fryrear, Mark Collins, and Bob Bee (Agricultural Research, Development and Education Center, Fort Collins); Merle Vigil, Dave Poss, Delbert Koch, Cody Hardy and Paul Campbell (USDA-ARS Central Great Plains Research Center, Akron); Kevin Larson, Dennis Thompson, and Deb Harn (Plainsman Research Center, Walsh); Mike Bartolo and Jeff Davidson (Arkansas Valley Research Center, Rocky Ford); and Frank Peairs, Jeff Rudolph, Thia Walker, Terri Randolph (Russian Wheat Aphid Program), for their work and collaboration that make these trials and this report possible.

The authors are thankful for the cooperation and unselfish contributions of land, labor and equipment made by the following Colorado wheat farmers who consent to having winter wheat variety performance trials conducted on their farms: John and Jensen Stulp (Lamar, Prowers County), Burl Scherler (Brandon, Kiowa County), Dennis and Matt Campbell (Arapahoe, Cheyenne County), Randy Wilks (Burlington, Kit Carson County), Jim Carlson (Julesburg, Sedgwick County), Steve Meakins (Haxtun, Phillips County), Cooksey Farms (Roggen, Weld County), Ross Hansen (Genoa, Lincoln County), Cary Wickstrom (Orchard, Morgan County), and Bill and Steve Andrews (Yuma, Yuma County).

We recognize valuable assistance provided by the CSU Extension agents who work with eastern Colorado wheat producers in all aspects of the COFT program: Bruce Bosley (Platte River agronomist); Wilma Trujillo (SE Area agronomist); Ron Meyer and Alan Helm (Golden Plains agronomists). We are also very thankful for the efforts and sacrifices made by Colorado wheat producers who contributed time, land, and equipment to the success of the Collaborative On-Farm Testing program.

Funded by the Colorado Wheat Administrative Committee, Colorado Wheat Research Foundation and Colorado State University.

Colorado State University

Crops Testing

Colorado State University
Extension

Department of Soil and Crop Sciences
1170 Campus Delivery
Fort Collins, Colorado 80523-1170

Jerry Johnson, Extension Specialist Crop Production