From the Ground Up

Agronomy News

Volume 28
Issue 3

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Newsletter of Soil & Crop Extension at Colorado State University

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Treating Wheat Seed for Disease Reduction

Bruce Bosley, CSU Extension

Wheat seed quality and disease prevention are a concern for many Colorado growers this year. Low test weight grain as well as shriveled or off color or black tipped grain are causing their concerns. Some of these potential problems can be addressed with fungicide seed treatments. The relative usefulness of fungicide seed treatments will depend on the situation.

If seed has a test weight of 55 pounds per bushel or less, but no evident disease problem (black point, loose smut, or common bunt), will a fungicide seed treatment be of any benefit? This is a hard question to answer, but it is possible that a fungicide seed treatment can improve or protect seedling vigor under stressful conditions.

Many Colorado producers have seen black point on kernels in their harvested grain. This disease can reduce germination rates and affect seedling vigor.

We also had a few reports and at least one confirmed case of fusarium head blight (scab) in Colorado this season. Head scab is much more common in higher moisture and especially higher humidity wheat growing regions. It can also impact germination and seedling vigor. Unless you've confirmed fusarium head blight in your Colorado field it is unlikely that you have it in your grain even despite our record precipitation received in June and July.

Pink seed has been found in some wheat samples. This is an inconsequential bacterial infection that should not be confused with fusarium head blight.

Kansas research shows that in many years, fungicide seed treatments result in small differences in germination and stand establishment. However, fungicides can have a greater impact in years when head scab and black point are affecting the seed quality.

Because Colorado climate is normally much drier than that experienced in other wheat belt states, it follows that fungicide treatments are even more unlikely to improve stand establishment. However, this year's weather in eastern Colorado, may induce some producers to decide to treat their wheat before planting this fall.

If seed has a low test weight or is infected with scab, the first step should be to have it cleaned hard to remove the lightest and poorest quality seeds. Once the seed lot has been cleaned, the seed should be tested for germination. If the germination is still lower than desired, you will probably want to adjust the seeding rate to make sure you hit your target plant population and may also consider fungicide seed treatment to help improve germination.

Producers need to be especially concerned that saved seed may be contaminated with diseases like loose smut or common (stinking) bunt. **If loose smut or common bunt were present in the field the small grain was harvested from, the grain should not be used for seed**. If the wheat fields were not scouted for these diseases, any saved seed has the potential to be infected with them. Treating saved seed with a low-cost fungicidal seed treatment (e.g. Dividend®, Raxil-Thiram®, or RaxilXT®) can reduce this risk. RTU Vitavax-Thiram® is a combination fungicide that is effective for reducing seedling diseases and may also provide some protection for loose smut and common bunt.

For a seed treatment fungicide to be effective, clean the grain before treatment and ensure thorough coverage of the grain with fungicide. Colorado State Extension recommends that grain known or suspected to have loose smut or common bunt be treated by a commercial seed treater. The fungicides which are effective for controlling loose smut and common bunt are normally applied using a slurry treatment method.

The most effective long-term solution to loose smut and common bunt is to always plant certified, fungicide-treated seed.

Finally, always eliminate volunteer wheat and other grassy weeds in harvested wheat fields at least 2 weeks prior to fall winter wheat planting to reduce the chances of wheat virus infections. Farmers can further reduce the virus potential by planting later in the normal winter wheat planting timeframe. Early planted wheat has a much higher potential for virus infections.

Aphid seed treatments (e.g. Gaucho® or Cruiser®) can reduce infection risks for barley or cereal yellow dwarf viruses. However, there are no insecticide treatments effective for controlling the wheat curl mite that serve as vectors for wheat streak mosaic virus, high plains disease, and triticum virus. Late planting and eliminating volunteer wheat are still the most effective measures that farmers can use to avoid wheat virus disease infections.

Events/Field Days

Lower South Platte Irrigation Research and Development Field Day
September 8 at 10:00 am approximately 1 mile northeast of Iliff, CO on Hwy 138
Tour of limited irrigation cropping systems and cool-season grass variety evaluation

2009 Dry Bean Field Days at Yuma & Holyoke
August 25, 2009.
10 am & 2 pm

2009 Eastern Colorado Winter Wheat Variety Performance Trials

Jerry Johnson and Scott Haley, Colorado State University

Colorado State University provides unbiased and reliable information to Colorado wheat producers to help them make better wheat 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. Variation in precipitation, as well as variable fall, winter, and spring temperature regimes, hail and spring freeze events, interact with disease and insect pests and variety maturity to affect wheat yields. As a consequence of large environmental variation, Colorado State University annually conducts a large number of performance trials, which 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.

2009 Trials

Planting and emergence conditions in the 2009 dryland Uniform Variety Performance Trials (UVPT) were favorable at many locations due to timely August and September rainfall events. Variety trial emergence was satisfactory to good across locations. Winter and spring drought characterized many trials to the degree that in May we were unsure if we would even be able to harvest several of the trials. Fortunately, May and June rains saved all of the trials except Akron where the moisture arrived too late and in too little quantity. Diseases (leaf rust, tan spot, viruses), Russian wheat aphids, and hail affected several of the trials. Finally, many trials, like many farmer fields, were rained on after maturity and it was difficult to find a dry weather window that allowed harvest. Akron was the only location where the data could not be used, nor combined with other location data, because of extreme field variation.

The growing conditions in the Irrigated Variety Performance Trial (IVPT) at Fort Collins, Haxtun, and Rocky Ford were conducive to medium level irrigated wheat yields. Cloudy May and June weather reduced the yield potential through reduced growing degree-days. Emergence and stand establishment were good although Rocky Ford was planted very late by comparison to other years. The Fort Collins irrigated trial yields were reduced partially due to winter drought that could not be abated via irrigation until late spring. Like the dryland trials, diseases, insects, hail and wet harvest conditions affected the irrigated trials as well.

There were 40 different entries in the dryland performance trials (UVPT) and 28 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 1.3 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 except at Burlington and Haxtun where test weight was measured from a cleaned grain sample of one replicate.

Summary of 2009 Dryland Variety Performance Results

Origin[1] Release Year	Variety[2]	Yield	Test Weight	Height
		bu/ac	lb/bu	in
CSU exp	CO04393	59.2	60.8	30
CSU exp	CO04499	58.5	60.8	30
CSU exp	CSU Blend09	58.4	59.6	28
CSU 2004	Bond CL	57.8	58.9	30
CSU exp	CO03W054-2	57.6	60.7	30
TX/A 2002	TAM 111	57.3	61.3	30
CSU 2006	Ripper	57.3	59.5	28
TX/W 2005	TAM 112	57.1	61.6	28
CSU-TX 2001	Above	57.1	59.8	28
NE 2008	Settler CL	56.9	59.8	28
AP 2005	NuDakota	56.4	58.9	27
CSU 2007	Bill Brown	56.2	60.6	28
CSU 1998	Prairie Red	56.2	59.7	27
CSU 2004	Hatcher	56.1	60.0	27
OK 2006	Duster	56.0	59.8	30
WB 2007	Winterhawk	55.7	61.1	29
NE 2004	Infinity CL	55.3	59.7	30
WB 2006	Smoky Hill	55.2	60.1	28
KSU 2005	Danby	55.0	60.6	28
NE 2006	Overland	54.5	59.9	31
AP exp	AP00x0100-51	54.4	60.3	29
NE 2008	Camelot	54.2	59.9	30
CSU 1994	Ankor	54.0	59.8	30
CSU 2008	Thunder CL	53.8	59.6	28
KSU 1999	Trego	53.7	60.2	28
WB 2008	Armour	53.5	59.0	25
AP 2006	Hawken	53.4	60.0	27
NE 2002	Goodstreak	53.4	60.5	34
CSU 2001	Avalanche	53.3	61.1	29
WB 2005	Keota	52.3	58.6	30
KSU 2006	Fuller	52.1	58.8	28
CSU 1981	Sandy	52.0	59.4	29
AP 2001	Jagalene	51.7	60.1	29
KSU 1994	Jagger	51.2	59.7	28
CSU 1991	Yuma	51.0	59.0	28
OK 2008	OK Rising	50.5	59.3	28
NE-USDA 2007	Mace	49.9	58.2	28
CSU 1999	Prowers 99	47.7	60.6	32
CSU 1973	Baca	47.5	60.2	33
	Average	54.5	59.9	29

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

[2]Varieties ranked according to average yield in 2009.

Summary of 2-Yr Dryland Variety Performance Results

Origin[1] Release Year	Variety[2]	2-Yr Average[3] Yield 2008-09	2-Yr Average[3] Test Weight 2008-09
		bu/ac	lb/bu
CSU 2006	Ripper	54.1	59.7
CSU exp	CO03W054-2	54.0	60.7
NE 2008	Settler CL	53.9	60.0
AP 2005	NuDakota	53.0	59.0
CSU-TX 2001	Above	52.7	60.0
TX/W 2005	TAM 112	52.4	61.3
CSU 2007	Bill Brown	52.3	60.8
CSU 2004	Bond CL	52.1	59.3
WB 2007	Winterhawk	52.1	61.2
TX/A 2002	TAM 111	51.9	61.2
CSU 2004	Hatcher	51.9	60.4
OK 2006	Duster	51.2	60.0
NE 2004	Infinity CL	51.2	60.0
CSU 1998	Prairie Red	51.2	59.8
WB 2006	Smoky Hill	51.1	60.5
KSU 1999	Trego	50.5	60.8
NE 2008	Camelot	50.2	60.2
AP 2006	Hawken	50.2	60.4
KSU 2005	Danby	49.7	61.2
NE 2006	Overland	49.5	60.1
KSU 2006	Fuller	48.9	59.6
WB 2005	Keota	48.7	59.0
CSU 1994	Ankor	48.6	59.9
NE 2002	Goodstreak	48.4	60.7
CSU 2008	Thunder CL	48.3	59.9
KSU 1994	Jagger	47.9	59.7
AP 2001	Jagalene	47.7	60.4
CSU 1991	Yuma	47.7	59.6
OK 2008	OK Rising	46.9	59.5
	Average	50.6	60.2

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

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

[3]2-yr average yield and test weight are based on ten 2009 trials and six 2008 trials.

Summary of 3-Yr Dryland Variety Performance Results

Origin[2] Release year	Market Class[3]	Variety[4]	Yield 2007-09	Test Weight 2007-09
			bu/ac	lb/bu
AP 2005	HWW	NuDakota	56.7	58.5
CSU 2004	HRW	Hatcher	55.7	60.0
CSU 2006	HRW	Ripper	54.3	58.8
CSU 2004	HRW	Bond CL	54.0	58.9
TX/W 2005	HRW	TAM 112	54.0	60.2
TX/A 2002	HRW	TAM 111	53.9	60.4
CSU 2007	HRW	Bill Brown	53.7	60.0
WB 2006	HRW	Smoky Hill	53.5	59.9
CSU-TX 2001	HRW	Above	53.4	59.2
NE 2004	HRW	Infinity CL	53.4	59.5
AP 2006	HRW	Hawken	53.4	59.7
OK 2006	HRW	Duster	53.4	59.9
KSU 2006	HRW	Fuller	52.5	59.3
NE 2006	HRW	Overland	52.3	59.5
WB 2005	HRW	Keota	52.1	59.4
KSU 2005	HWW	Danby	51.9	61.1
CSU 2008	HWW	Thunder CL	51.7	59.4
CSU 1998	HRW	Prairie Red	51.4	59.0
KSU 1994	HRW	Jagger	51.3	59.4
KSU 1999	HWW	Trego	50.9	60.4
CSU 1991	HRW	Yuma	50.8	59.3
AP 2001	HRW	Jagalene	50.2	60.3
CSU 1994	HRW	Ankor	49.9	59.1
NE 2002	HRW	Goodstreak	48.0	60.3
		Average	52.6	59.6

[1]2-yr and 3-yr average yield and test weight are based on ten 2009 trials, six 2008 trials, and eleven 2007 trials.

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

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

[4]Varieties ranked according to average 3-yr yield.

Summary of 2009 Irrigated Variety Performance Results

Origin[1] Release Year	Variety[2]	Yield	Test Weight	Height	Lodging Rocky Ford 2009	Lodging Haxtun 2009	BYDV Rocky Ford	Heading days different from trial average at Fort Collins
		bu/ac	lb/bu	in	scale 1-9[3]	scale 1-9[3]	scale 1-9[4]	days +/- ave[5]
NE 2008	Settler CL	94.5	60.3	37	1	1	1	1
TX/A 2002	TAM 111	92.5	59.5	38	4	1	3	1
CSU exp	CO04393	92.0	59.2	38	5	3	3	-1
WB 2006	Aspen	92.0	57.1	34	2	1	4	-1
CSU 2006	Ripper	88.0	56.9	36	6	2	3	-1
WB 2008	Armour	88.0	58.1	32	5	1	2	-1
CSU 1998	Prairie Red	87.9	58.6	35	8	2	1	0
CSU 2008	Thunder CL	87.9	57.8	37	4	1	2	0
KSU 2005	Danby	87.3	60.8	38	9	2	3	0
AP 2001	Jagalene	87.3	59.1	37	3	1	4	0
CSU 2004	Bond CL	86.7	58.5	38	5	2	3	0
WB 2008	Hitch	85.7	58.3	35	4	1	4	1
NE 2008	Anton	84.1	59.7	36	4	1	4	1
AP 2005	NuDakota	83.0	57.2	34	3	1	6	0
TX/W 2005	TAM 112	83.0	60.1	38	8	3	2	-1
CSU 2002	Ankor	82.7	57.6	37	7	2	3	0
WB 2005	Keota	82.4	57.6	38	4	2	1	1
CSU exp	CO03W054-2	81.4	58.5	38	8	8	3	0
CSU exp	CO04499	81.3	59.0	41	6	4	2	-1
CSU 2007	Bill Brown	80.9	59.0	34	7	1	6	-1
AP exp	AP00x0100-51	79.4	58.4	36	3	1	4	0
KSU 2006	Fuller	78.0	57.4	35	6	1	4	0
CSU 2004	Hatcher	76.2	57.4	36	8	4	3	1
CSU 1991	Yuma	75.7	57.3	36	5	2	6	1
NE 2007	Mace	75.4	58.5	35	2	1	5	2
AP 2006	Hawken	74.9	58.1	33	6	1	5	-1
OK 2008	OK Rising	70.2	57.2	35	1	1	3	1
	Average	83.6	58.4	36.1	4.9	1.9	3.4	0

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

[2]Varieties are ranked according to average yield in 2009.

[3]Lodging score: 1=completely erect, 9=completely lodged.

[4]*Barley yellow dwarf virus* symptom score: 1=no symptoms, 9=severe symptoms

[5]Negative differences indicate heading before trial average heading date, positive differences indicate later than trial average.

Summary of 2-Yr Irrigated Variety Performance Results

Origin[2] Release Year	Variety[3]	Yield 2008-09	Test Weight 2008-09	Height 2008-09	Lodging 2008-09	Heading days different from trial average at Fort Collins 2008-09
		bu/ac	lb/bu	in	scale 1-9[4]	days +/- ave[5]
CSU exp	CO04393	93.7	60.2	35	5	1
CSU 2008	Thunder CL	92.6	58.9	33	3	0
TX/A 2002	TAM 111	91.7	60.4	34	4	1
AP 2005	NuDakota	91.3	58.8	31	3	-1
AP 2001	Jagalene	91.1	60.2	34	4	1
CSU 2004	Bond CL	89.9	58.1	34	5	-1
CSU 1998	Prairie Red	89.5	59.3	31	5	-2
WB 2006	Aspen	87.3	57.4	30	4	-1
WB 2005	Keota	86.9	59.0	35	5	1
CSU exp	CO03W054-2	85.0	59.5	35	8	1
NE 2008	Anton	84.1	60.7	33	2	2
CSU 2007	Bill Brown	83.9	59.3	31	5	0
CSU 2004	Hatcher	83.7	59.1	32	7	2
CSU 1991	Yuma	83.7	58.6	33	5	1
CSU exp	CO04499	83.3	60.2	36	6	-1
AP 2006	Hawken	82.8	59.2	29	5	-2
TX/W 2005	TAM 112	82.8	61.2	33	7	-2
OK 2008	OK Rising	80.7	59.0	32	1	0
	Average	86.9	59.4	33	5	0

[1]2-yr averages in the table above are based on three 2008 trials and three 2009 trials.

[2]Variety origin code: CSU=Colorado State University; WB=WestBred, LLC; AP=AgriPro COKER;

TX/A=Texas A&M release, marketed by AgriPro COKER; TX/W=Texas A&M release, marketed by Watley S

NE=University of Nebraska; OK=Oklahoma State University.

[3]Varieties ranked according to average 2-yr yield.

[4]Lodging score: 1=completely erect, 9=completely lodged.

[5]Negative differences indicate heading before trial average heading date, positive differences indicate later than trial average.

Summary of 3-Yr Irrigated Variety Performance Results

Origin[2] Release Year	Variety[3]	Yield 2007-09	Test Weight 2007-09	Height 2007-09	Lodging 2007-09	Heading days different from trial average at Fort Collins 2007-09
		bu/ac	lb/bu	in	scale 1-9[4]	days +/- ave[5]
AP 2005	NuDakota	92.4	58.4	31	4	-1
CSU 2008	Thunder CL	92.2	59.1	33	3	-1
CSU 2004	Bond CL	91.7	58.7	35	4	-1
TX/A 2002	TAM 111	90.2	60.2	34	4	1
AP 2001	Jagalene	89.3	60.1	33	4	1
CSU exp	CO03W054-2	88.4	59.7	35	7	1
TX/W 2005	TAM 112	88.3	61.0	33	6	-2
CSU 2007	Bill Brown	87.8	59.6	32	5	0
CSU 1991	Yuma	87.2	58.8	33	4	1
WB 2005	Keota	86.4	59.4	35	5	1
CSU 2004	Hatcher	85.6	59.5	33	7	1
CSU 1998	Prairie Red	85.3	59.3	31	5	-2
WB 2006	Aspen	85.2	57.9	31	3	-1
NE 2008	Anton	84.1	60.7	33	2	3
AP 2006	Hawken	83.8	59.4	30	4	-2
	Average	87.9	59.4	33	4	0

[1] 2-yr averages in the table above are based on three trials in 2007, 2008 and 2009.

[2] Variety origin code: CSU=Colorado State University; WB=WestBred, LLC; AP=AgriPro COKER; TX/A=Texas A&M release, marketed by AgriPro COKER; TX/W=Texas A&M release, marketed by Watley Seed Co.; NE=University of Nebraska.

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

[4] Lodging score: 1=completely erect, 9=completely lodged.

[5] Negative differences indicate heading before trial average heading date, positive differences indicate

2009 Collaborative On-Farm Test (COFT) Results

Much of Colorado's 2009 wheat acreage was planted to winter wheat varieties that have been tested in the COFT program which is in its 11th year of operation. In the fall of 2008, twenty- four eastern Colorado wheat producers planted COFT trials in Baca, Prowers, Kiowa, Cheyenne, Kit Carson, Washington, Phillips, Logan, Adams, and Weld counties. Each collaborator planted five 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. Viable harvest results were obtained from 19 of the 24 tests- most of the failed tests were lost to severe hail damage.

The objective of the 2009 COFT was to compare performance and adaptability of popular and newly-released CSU varieties (Hatcher, Ripper, and Bill Brown), and promising commercial varieties from WestBred (Keota) and AgriPro (Hawken) under unbiased testing conditions. The COFT trial results are intended 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. Interpreted as an average of 19 test results, the 2009 COFT results can be useful to farmers making variety decisions.

<u>Eastern Colorado Extension Wheat Educators</u>

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2009 Collaborative On-Farm Tests (COFT) Variety Performance Results

	2009 Varieties[1]										COFT	
	Ripper		Hatcher		Bill Brown		Hawken		Keota		Average	
	Yield	Test Wt	Yield	Test Wt	Yield	Test Wt	Yield	Test Wt	Yield	Test Wt	Yield	Test Wt
County/Town	bu/ac[2]	lb/bu	bu/ac[2]	lb/bu	bu/ac[2]	lb/bu	bu/ac[2]	lb/bu	bu/ac[2]	lb/bu	bu/ac[2]	lb/bu
Adams/Bennett N.	35.6	60.5	40.4	61.5	38.5	60.0	38.2	60.5	37.2	60.5	38.0	60.6
Adams/Brighton E.	59.1	60.5	49.3	61.5	54.9	62.5	49.9	62.0	51.0	60.5	52.9	61.4
Baca/Walsh	26.7	63.0	27.4	62.0	25.3	63.0	22.4	62.0	24.4	63.0	25.2	62.6
Baca/Springfield	23.1	59.0	20.2	59.0	19.1	58.0	19.0	58.0	16.4	58.0	19.6	58.4
Baca/Vilas	28.2	60.0	28.1	60.0	23.1	63.0	20.3	60.0	22.7	60.0	24.5	60.6
Kiowa/Haswell	48.4	62.0	48.7	63.0	49.4	65.0	46.8	64.0	48.6	63.0	48.4	63.4
Cheyenne/Arapahoe	55.4	58.0	57.7	59.0	57.0	60.0	48.9	58.0	50.2	59.0	53.8	58.8
Logan/Sterling W	54.6	57.5	61.8	59.5	60.1	60.5	51.4	59.0	51.3	60.0	55.8	59.3
Logan/Fleming	30.7	55.0	34.9	56.5	38.0	58.0	29.3	56.5	30.7	57.0	32.7	56.6
Logan/Peetz	29.3	58.5	28.2	60.0	28.1	60.6	22.3	61.0	27.3	61.5	27.0	60.3
Phillips/Haxtun W.	51.8	60.0	56.4	61.0	49.4	60.0	56.8	58.0	54.7	60.0	53.8	59.8
Phillips/Haxtun S.	43.7	60.0	56.1	60.0	53.3	60.0	45.1	59.0	45.7	59.0	48.8	59.6
Phillips/Central	66.0	60.0	65.4	60.0	72.0	60.0	64.9	60.0	67.7	57.0	67.2	59.4
Prowers/Lamar	20.1	61.0	18.1	60.0	20.5	62.0	23.8	62.0	19.8	61.0	20.5	61.2
Washington/Akron	51.7	58.5	46.4	59.0	48.9	60.0	47.9	59.0	42.5	60.5	47.5	59.4
Washington/Woodlin	73.4	59.0	43.3	59.0	43.4	58.5	53.2	59.0	54.0	59.0	53.5	58.9
Washington/Woodrow	41.1	58.0	48.4	59.0	34.7	58.0	42.9	58.5	35.4	58.5	40.5	58.4
Weld/New Raymer	44.0	63.5	48.1	62.5	53.1	63.0	43.6	63.5	43.9	63.0	46.5	63.1
Yuma/Yuma	50.4	57.0	31.4	54.0	33.1	60.0	34.3	57.0	36.4	54.0	37.1	56.4
Average Yield/Test Wt	43.9	59.5	42.6	59.8	42.2	60.6	40.1	59.8	40.0	59.7	41.7	59.9
Significance[3] Yield	a		ab		b		c		c			
Significance[3] Test Wt		b		b		a		b		b		

LSD $_{(0.30)}$ for yield = 1.5 bu/ac   LSD $_{(0.30)}$ for test weight = 0.3 lb/bu

[1]Varieties are ranked left to right according to yield in 2009

[2]Yield corrected to 12% moisture

[3]Significance: Varieties with different letters are significantly different from one another based on the LSD values (1.5 bu/ac for yield and 0.3 lb/bu for test weight)

Winter Wheat Variety Selection in Colorado for Fall 2009

Variety performance summary tables from CSU are intended to provide reliable and unbiased information to farmers, seed producers, and wheat industry representatives but choosing a variety is a personal decision made by every farmer for every field before planting every year. This section 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, especially not to select a variety based upon performance at a single location in one year.
- Producers should consider planting more than one variety based on different maturity, disease or insect resistance, test weight, lodging, herbicide resistance, coleoptile length, height, or end-use quality characteristics. These non-yield traits are useful to spread your risk due to the unpredictability of next year's climatic conditions and pest problems.
- All varieties available for planting this fall are considered to be susceptible to prevalent races of RWA and thus resistance to the original RWA biotype should not be a consideration for fall of 2009.
- Producers should control volunteer wheat and weeds to avoid the negative effects of a green bridge that could lead to serious virus disease infestations vectored by the wheat curl mite or other insects. High presence of virus in 2009, coupled with wet weather conditions of early summer 2009, are of special concern as a possible source of virus for infection in the 2010 crop.
- 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/00555.pdf).

Although many new varieties possessing valuable traits and with high potential are in the breeding and selection process, emphasis here is placed on variety yield performance over the past three years and the specific traits they possess.

<u>Ten dryland wheat varieties to consider based on the order of relative performance for three years</u>

NuDakota (HWW) – A medium-maturity 2005 Agripro hard white wheat (HWW) variety that has high yield and excellent resistance to both leaf and stripe rust. NuDakota is a shorter variety, has low test weight, and relatively poor baking quality characteristics. NuDakota will probably not be planted on many Colorado acres due to current marketing issues with HWW. On a 3-yr average NuDakota is also the highest yielding irrigated variety.

Hatcher – This medium maturing, high yielding 2004 CSU HRW variety was planted on more Colorado wheat acres in fall 2008 than any other variety. It has good stress tolerance, good test weight and 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 is extremely stable, having been in the top three of the three year yield averages every year since 2003. Hatcher remains the most highly recommended HRW wheat variety based on 3-yr average yield, stress tolerance, and resistance to stripe rust.

Ripper – An early maturing HRW 2006 CSU release that is high yielding in low yield environments, taller than Hatcher, and has excellent baking quality. It has relatively lower test weight, and is susceptible to both leaf and stripe rust. Like Hatcher, Ripper has also shown extremely stable yields, being in the top three of the three year yield averages ever year since 2005.

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. We expect it to become increasingly popular under irrigation where it has been tough to beat and test weight is less of an issue.

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, long coleoptile, early maturity, and good test weight and baking quality. It is susceptible to leaf and stripe rust and has poor straw strength.

TAM 111 – A HRW 2002 release from Texas A&M and marketed by AgriPro has good test weight, good straw strength and good stripe rust resistance making it well adapted to irrigated conditions. TAM 111 also has good milling and baking characteristics but is susceptible to leaf 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. Certified seed will be available for planting in fall 2009.

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

Infinity CL – A later maturing, taller HRW variety released in 2004 from the University of Nebraska that has, in addition to the Clearfield* herbicide tolerance trait, a good combination of high yield, average test weight, and good stripe rust resistance. Although later maturing than Above, it is taller, has much better stripe rust resistance, and is similar to Above for yield.

<u>Dryland varieties to watch in the future that have been in Colorado variety trials for two years</u>

CO03W054-2 – This CSU experimental hard white will be released in fall 2009 (final naming pending). It is a medium maturing, taller semidwarf with excellent milling and baking quality. It has good resistance to wheat streak mosaic virus and stripe rust and moderate sprouting tolerance. CO03W054-2 has relatively poor straw strength and will not be recommended for high-yield irrigated conditions. CO03W054-2 will be handled in CWRF ConAgra Mills Ultragrain® Premium Program for hard white wheat (HWW).

Settler CL – This 2008 Nebraska release is a HRW Clearfield* winter wheat that has performed well in 2 years of testing and has good test weight. It is later maturing, medium height, and moderately susceptible to leaf and stripe rust.

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.

<u>Four irrigated wheat varieties to consider based on the order of relative performance for three years</u>

The most important variety selection criteria for irrigated varieties are yield, straw strength, and stripe rust resistance.

NuDakota (HWW) – high yielding irrigated variety with better straw strength than Bond CL. It has low test weight that is more manageable and less of a concern in irrigated conditions. Good resistance to both leaf and stripe rust.

Thunder CL is a CSU 2008 hard white Clearfield* wheat release with excellent irrigated yield, good straw strength, and excellent baking quality. It has moderate resistance to stripe rust and wheat streak mosaic virus but is moderately susceptible to pre-harvest sprouting. Thunder CL will be handled in CWRF ConAgra Mills Ultragrain® Premium Program for hard white wheat (HWW).

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.

TAM 111 – A HRW 2002 release from Texas A&M and marketed by AgriPro that is a high yielding irrigated variety with good straw strength, excellent resistance to stripe rust, and good test weight.

Description of winter wheat varieties in eastern Colorado trials.

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	5	5	3	7	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.
Ankor Hard red winter Akron/Halt//4*Akron	CSU 2002	R*	5	6	5	5	8	9	9	5	6	5	CSU release (2002). Backcross derivative of Akron with resistance to RWA biotype 1.
Anton Hard white winter WA691213-27/N86L177//Platte	NE-USDA 2008	S	9	2	1	4	7	6	--	3	7	7	University of Nebraska-USDA release (2008), first entered in CSU irrigated trials in 2008. Short semidwarf, medium maturing, hard white winter wheat (HWW). Excellent straw strength, best adapted to irrigated production.
AP00x0100-51 Hard red winter W95-301/W98-151	Agripro EXP	S	4	5	5	4	3	3	--	3	--	--	Unreleased Agripro hard red experimental line. First entered in CSU trials in 2009, no prior testing in regional breeder trials.
Armour Hard red winter B1551-WH/KS94U326	Westbred 2008	S	1	1	1	7	2	8	--	7	5	5	Westbred release (2008). First entered in CSU trials in 2009. Early maturing semidwarf, stripe rust resistance.
Aspen Hard white winter TAM 302/B1551W	Westbred 2006	S	3	2	1	6	4	3	5	7	6	6	Westbred release (2006). Hard white winter wheat (HWW), good sprouting tolerance. Short semidwarf, good leaf and stripe rust resistance. First tested in CSU irrigated trials in 2007 and dryland trials in 2008.
Avalanche Hard white winter KS87H325/Rio Blanco	CSU 2001	S	6	6	5	5	8	8	5	2	2	5	CSU release (2001). Hard white winter wheat (HWW), sister selection to Trego, high test weight. Leaf and stripe rust susceptible. Moderate sprout susceptibility.
Baca Hard red winter Scout Selection	CSU 1973	S	5	9	9	9	6	4	7	4	3	3	CSU release (1973). Developed from a selection from Scout. Early maturing, tall, long coleoptile, good emergence and fall growth and stand establishment characteristics. Low yield relative to modern wheat varieties.
Bill Brown Hard red winter Yumar/Arlin	CSU 2007	R*	5	3	4	2	4	2	6	2	4	3	CSU release (2007). Good dryland and irrigated yield record in CSU trials. High test weight, good leaf and stripe rust resistance. Stem rust susceptible. Good baking quality, short coleoptile.
Bond CL Hard red winter Yumar//TXGH12588-120*4/FS2	CSU 2004	R*	6	6	6	5	8	6	8	8	7	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.

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.

Description of winter wheat varieties in eastern Colorado trials.

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL	YR	LR	WSMV	TW	MILL	BAKE	Comments
Camelot Hard red winter KS91H184/Arlin SIB//KS91HW29/3/NE82761/Redland/4/VBF0168	NE 2008	S	3	7	7	6	7	2	--	6	6	6	Nebraska release (2008). Medium-early, taller wheat. Good leaf rust resistance, moderately susceptible to stripe rust. First entered in CSU dryland trials in 2008.
CO03W054-2 Hard white winter KS96HW94//Trego/CO960293	CSU EXP	S	7	6	8	5	4	5	2	4	2	2	CSU experimental hard white, targeted for release fall 2009. Medium-maturing, taller semidwarf. Good resistance to wheat streak mosaic virus and stripe rust, moderate sprouting tolerance, excellent milling and baking quality.
CSU Blend09 Hard red winter Hatcher-Ripper Blend	CSU 2004/2006	R*	3	4	4	--	6	8	--	6	--	--	50:50 blend of Hatcher and Ripper. First entered into CSU Dryland Variety Trial (UVPT) in 2009.
Danby Hard white winter TREGO/JGR 8W	KSU 2005	S	4	5	4	4	4	6	5	2	2	7	KSU-Hays release (2005). Hard white wheat (HWW), very high test weight. Similar to Trego with improved stripe rust resistance and preharvest sprouting tolerance.
Duster Hard red winter WO405D/HGF112//W7469C/HCF012	OK 2006	S	8	8	3	2	8	2	7	4	3	5	Oklahoma State release (2006). Good yield performance in western Plains breeder trials, first tested in CSU trials in 2007. Medium tall, medium late, short coleoptile, leaf rust resistant, stripe rust susceptible.
Fuller Hard red winter Bulk selection	KSU 2006	S	2	3	8	4	2	2	5	5	6	5	KSU-Manhattan release (2006). First tested in CSU trials in 2007. Early maturing semidwarf. Average test weight, good leaf and stripe rust resistance. Lower straw strength.
Goodstreak Hard red winter SD3055/KS88H164//NE89646 (=COLT*2/PATRIZANKA)	NE 2002	S	6	9	8	9	5	5	8	3	2	8	Nebraska release (2002). Later maturing tall wheat. Long coleoptile, good test weight, marginal baking quality.
Hatcher Hard red winter Yuma/PI 372129//TAM-200/3/4*Yuma/4/KS91H184/Vista	CSU 2004	R*	6	2	6	5	4	8	8	4	2	4	CSU release (2004). Medium maturing semidwarf. Good test weight, good stripe rust resistance. 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	5	2	2	8	4	5	6	Agripro release (2006). First tested in CSU trials in 2007. Medium maturing, short semidwarf. Good leaf and stripe rust resistance, good straw strength, good quality.
Hitch Hard red winter 53/3/ABL/1113//K92/4/JAG/5/KS89180B	Westbred 2008	S	6	2	2	2	3	8	--	4	6	8	Westbred release (2008). First entered in CSU trials in 2009, positioned for High Plains irrigated production. Good straw strength, good stripe rust resistance, marginal baking quality.

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.

Description of winter wheat varieties in eastern Colorado trials.

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL	YR	LR	WSMV	TW	MILL	BAKE	Comments
Infinity CL Hard red winter Windstar/3/NE94481//TXGH125888-120*4/FS2	NE 2004	S	5	7	6	6	4	3	--	4	4	4	Nebraska release (2005). Clearfield* winter wheat. Medium maturing, taller wheat. Improved baking quality relative to Above. Develops "leaf speckling" similar to Hatcher.
Jagalene Hard red winter Abilene/Jagger	Agripro 2001	S	5	5	5	4	3	9	4	3	2	5	Agripro release (2001). Good test weight, good stripe rust resistance, good wheat streak mosaic virus tolerance. Observed to shatter in CO and KS trials. Very leaf rust susceptible.
Jagger Hard red winter KS82W418/Stephens	KSU 1994	S	3	5	5	5	2	9	4	5	5	3	KSU-Manhattan release (1994). Early maturing semidwarf, good baking quality, good WSMV tolerance and stripe rust resistance, very leaf rust susceptible. Breaks dormancy very early in the spring.
Keota Hard red winter Custer/Jagger	Westbred 2005	S	5	6	5	5	2	8	8	6	6	6	Westbred release (2005). First tested in CSU trials in 2005. Good stripe rust resistance, leaf rust susceptible. Taller plant stature, maintains height under stress.
Mace Hard red winter YUMA//T-57/3/CO850034/4/4*YUMA/5/(KS91H184/ARLIN S/KS91HW29//NE89526)	NE-USDA 2007	S	8	3	2	1	2	4	1	9	6	3	Nebraska release (2008). First entered in CSU trials in 2009. Later maturing, medium height. Excellent resistance to wheat streak mosaic virus but low yield in absence of wheat streak. Low test weight, very short coleoptile.
NuDakota Hard white winter Jagger/Romanian	Agripro 2005	S	5	2	3	4	2	2	4	9	7	5	Agripro release (2005). Hard white wheat (HWW). Medium maturing, short semidwarf. Very good dryland and irrigated yields, good leaf and stripe rust resistance. Moderate sprouting tolerance, very low test weight.
OK Rising Hard white winter KS96WGRC39/Jagger	OK 2008	S	4	5	2	3	3	8	--	6	2	2	Oklahoma State release (2008). Hard white reselection from OK Bullet. First entered in CSU dryland and irrigated trials in 2008. Excellent straw strength and quality, good stripe rust resistance, good sprout tolerance.
Overland Hard red winter Millennium 'S'/ND8974	NE 2006	S	9	8	4	5	3	2	--	7	5	8	Nebraska release (2006) as "Husker Genetics Brand Overland". First tested in CSU trials in 2007. Taller, later maturing. Good leaf and stripe rust resistance, lower test weight, poor baking quality.
Prairie Red Hard red winter CO850034/PI372129//5*TAM 107	CSU 1998	R*	4	3	3	6	9	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.
Prowers 99 Hard red winter CO850060/PI372129//5*Lamar	CSU 1999	R*	9	8	8	8	5	6	7	2	5	1	CSU release (1999), reselection from Prowers. Tall, long coleoptile, medium-late maturity, high test weight, excellent milling and baking quality characteristics.

Russian wheat aphid resistance (RWA), heading date (HD), plant height (HT), straw strength (SS), coleoptile length (COL), stripe rust resistance (YR), leaf rust resistance (LR), wheat streak mosaic virus tolerance (WSMV), test weight (TW), milling quality (MILL), and baking quality (BAKE). Rating scale: 1 - very good, very resistant, very early, or very short to 9 - very poor, very susceptible, very late, or very tall.

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Description of winter wheat varieties in eastern Colorado trials.

Name, Class, and Pedigree	Origin	RWA*	HD	HT	SS	COL	YR	LR	WSMV	TW	MILL	BAKE	Comments
Ripper Hard red winter CO940606/TAM107R-2	CSU 2006	R*	2	4	4	7	9	9	7	7	2	2	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.
Sandy Hard red winter Mexican spring semidwarf/Trapper//Centurk	CSU 1981	S	5	8	6	8	8	8	--	4	3	4	CSU release (1981). Tall, medium-late, good stand establishment, good tolerance to root rot and crown rot. Low yield relative to modern wheat varieties.
Settler CL Hard red winter N95L164/3/MILLENNIUM SIB//TXGH125888-120*4/FS2	NE 2008	S	8	5	3	6	7	8	--	4	4	6	Nebraska release (2008). Clearfield* winter wheat. First entered in CSU dryland trials in 2008, good dryland yield on two-year average. Later maturing, medium height. Moderately susceptible to leaf and stripe rust.
Smoky Hill Hard red winter 97 8/64 MASA	Westbred 2006	S	6	3	4	4	2	2	8	5	5	2	Westbred release (2006). First tested in CSU trials in 2007. Medium late, shorter semidwarf. Good leaf and stripe rust resistance, good baking quality.
TAM 111 Hard red winter TAM-107//TX78V3630/CTK78/3/TX87V1233	TX 2002	S	6	7	3	6	2	8	5	2	3	4	Texas A&M release (2002), marketed by Agripro. Medium maturing, taller wheat. Good test weight, good milling and baking quality, good straw strength. Leaf rust susceptible, good stripe rust resistance.
TAM 112 Hard red winter U1254-7-9-2-1/TXGH10440	TX 2005	S	2	4	7	7	9	9	2	2	6	6	Texas A&M release (2005), marketed by Watley Seed. First tested in CSU trials in 2007. Good test weight, good quality, excellent wheat streak mosaic virus tolerance. Susceptible to leaf and stripe rust, lower straw strength.
Thunder CL Hard white winter KS01-5539/CO99W165	CSU 2008	R*	4	4	3	5	3	5	4	4	5	2	CSU release (2008). Hard white Clearfield* wheat. Good straw strength, top yields under irrigation. Excellent baking quality, moderate resistance to stripe rust and wheat streak mosaic virus, moderate sprout susceptibility.
Trego Hard white winter KS87H325/Rio Blanco	KSU 1999	S	6	4	6	5	8	7	5	2	2	6	KSU release (1999). Hard white winter wheat (HWW), medium-late maturity, semidwarf, high test weight. Susceptible to both leaf and stripe rust.
Winterhawk Hard red winter 474S10-1/X87807-26//HBK0736-3	Westbred 2007	S	5	5	5	7	3	8	5	2	2	4	Westbred release (2007). First tested in CSU dryland trials in 2008. Medium maturing, medium tall, longer coleoptile. Good stripe rust resistance, susceptible to both leaf and stem rust. Good test weight, good quality.
Yuma Hard red winter NS14/NS25//2*Vona	CSU 1991	S	6	3	3	2	6	5	6	6	7	3	CSU release (1991). Medium maturity, semidwarf, short coleoptile, good baking quality characteristics. Good yields under dryland conditions and 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.

Meet the Faculty - Dr. Joe Brummer

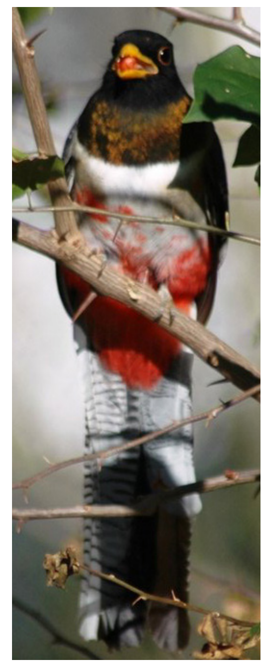
I have been affiliated with the Department of Soil and Crop Sciences since 1994. My first position was as Superintendent and Research Scientist at the Mountain Meadow Research Center in Gunnison. Due to budget cuts, the Center was closed and I transferred to the main campus in 2006, joining the faculty as Associate Professor and Forage Specialist. I have a three-way appointment with research, teaching, and extension responsibilities.

I grew up in south-central Kansas on a small family farm near the town of Zenda. We raised primarily dryland wheat and some forage sorghum for livestock feed, and had about 40 head of mother cows. After a short time at Colorado State University with a major in forestry, I soon changed my major to something I knew a little more about, managing cows and rangeland (Range Ecology). After completing my BS at CSU, I went on to complete a master's degree in Agronomy (Range Management) at Oklahoma State University. Upon completion of my MS, I obtained a job as Range Research Coordinator with the University of Nebraska at the West Central Research and Extension Center in North Platte where I worked primarily on upland range and subirrigated hay meadow research in the Sandhills region. I completed my PhD in Agronomy (Range Management) while working for the University of Nebraska.

After graduation, I started work with CSU at the Mountain Meadow Research Center in Gunnison where I worked primarily on issues dealing with high-elevation forage production in irrigated hay meadows. Projects included research on interseeding of legumes into grass dominated meadows to improve both the quantity and quality of hay produced, yield responses to lower rates of nitrogen fertilization, potential benefits of soil aeration, and timing of harvest for improved regrowth and forage quality. I was also involved with faculty in the College of Natural Resources for a number of years looking at methods of restoring vegetation on fluvial mine tailing deposits near Leadville. I was also privileged to work on an upland range project while in Gunnison which investigated methods of improving sagebrush habitat for the benefit of sage-grouse.

My research interests tend to be broad and since transferring to the main campus, projects that I have become involved with include potential adaptation of living mulch cropping systems for use under irrigated conditions, evaluation of grass and grass/legume mixes using organic production methods, and evaluation of alfalfa and various cool-season grasses under limited irrigation.

When not at work, my wife and I enjoy camping and hiking throughout Colorado and other western states taking wildflower photos and adding to our bird lists. The Elegant Trogon found in southeastern Arizona was a really cool bird. It has a call that sounds kind of like a barking dog.



Establishing late summer perennial forages

Bruce Bosley, CSU Extension

Late summer is an excellent time to plant cool-season grasses and alfalfa in irrigated fields to be used for grazing or haying. Compared to spring plantings, late summer establishment is preferred because the warm soils promote rapid seedling development and annual weeds are less competitive. Secondly, perennial grasses and alfalfa that are established in the late summer and fall can be expected to provide considerable early spring growth the following year. Farmers have reported obtaining 60 to 75% of what they expect for an established hay crop in the first year after fall planting.

Irrigated pastures provide an opportunity for livestock producers to extend their forage resource base. Ranchers can integrate irrigated pastures with existing native range and improved dryland pastures to optimize their operation's forage production and more closely match forage availability with the nutritional requirements of their herds. Managed properly, irrigated pastures can enhance livestock performance and boost net farm profits.

Perennial forage plantings can begin as early as August 15th, but should be completed by September 10th in Colorado at elevations of 6,000 feet or below. Plantings at higher elevations need to be timed earlier to avoid killing frost. Grasses and alfalfa need at least four to six weeks of growth before fall dormancy sets in to have enough energy reserves to be able to overwinter successfully.

Plan well enough ahead to improve success in planting perennial forages. Manage fields early to reduce weeds, plan herbicide use to avoid carryover problems, and maintain crop residue protection on erosive soils. It is often easiest to apply phosphorus fertilizer to the crop planted prior to grass and alfalfa plantings, especially where the forage seed is to be planted no-till into that crop's stubble.

Grass species/variety selection

Perennial grass and grass mixture selection is dependent on the particular soil conditions in a field, irrigation water availability, desired use, and producer's management capability. For example, only certain perennial grass species and varieties will establish and thrive on salty or high pH soils. Buyers often want high yielding and high quality grass species for their pasture seedings. These species tend to require highly productive soils, ample irrigation water, proper fertilizer timing, and proper grazing or harvest management. These grasses often die out rapidly when all of these conditions are not met. Other grasses may be lower yielding, but are also more forgiving to imperfect soil, water, fertility, and harvest management.

The best livestock performance on grazed irrigated pastures can be obtained when alfalfa or other legumes are co-seeded with individual grasses or grass mixtures. However, producers must manage for bloat when using legumes, primarily alfalfa, in their pastures.

Cool-season grasses are preferred compared to warm-season grasses for irrigated pastures. Cool-season grasses are more responsive to irrigation and fertilizers. Cool-season grasses generally have higher feed value and retain their quality better when hayed than warm-season grasses. They are also more productive at higher elevations. The most popular forage species for lower elevation, cool-season pastures are: orchardgrass, meadow brome, smooth brome, and alfalfa. The following species are also used in Colorado's irrigated pastures: tall fescue, intermediate, pubescent, and hybrid wheatgrass, timothy, creeping meadow foxtail, perennial ryegrass, and reed canarygrass. Experience has shown that legumes such as birdsfoot trefoil, sainfoin, and alsike, white, red, or Kura clovers are slower to establish and best seeded in the spring. Contact your County or Area Extension Office for help in finding the forage species and varieties that fit your fields and management.

Field Preparation

Successful forage plantings are possible on either tilled ground or into past crop stubble. No-till plantings are most successful when seeding into small grain, millet, sorghum (hay or silage), or corn stubble. The biggest advantage to planting into crop stubble comes from providing

wind protection to emerging seedlings and reducing erosion during fall and winter. No-till practices also increase capture and retention of soil moisture compared to tilled field preparation techniques.

Weed and crop volunteer control is essential during field preparation for stubble or tilled plantings alike. Forage seedlings are poor competitors when annual or perennial weeds are present. These undesirable plants compete with the forage seedlings for moisture, sunlight, and nutrients. Once established, perennial forages are excellent competitors and, when managed well, can be expected to eliminate nearly all annual weeds and reduce perennial growth and dissemination. Herbicide applications are substituted for tilling prior to planting for controlling weeds.

The costs for spraying and herbicides may appear high. However, these expenses may be entirely offset when considering the elimination of tillage operation costs such as fuel, operator wages, and equipment depreciation.

No-till systems require farmers to pay attention to managing different factors than those associated with conventional tillage. For example, management of previous crop residues becomes more critical for being able to obtain good seed to soil contact. Removing excess crop residues can be done through grazing or haying to improve planter operation. Four to six inch stubble is optimum. Some planters can cope with taller stubble. Talking with a no-till neighbor is a good way to learn how to handle the transition into no-till farming.

When tillage is used for preparing fields for forage seeding, the goal is to provide a firm seedbed free of weeds, crop volunteer and large clods. Seedbed firmness is easily determined by walking across the field and measuring the depth of your footprint. Pack the seedbed until footprints sink no deeper than a half inch. Soil is normally firm enough when planting into untilled crop stubble grown earlier in the same or previous season. Tillage operations done in preparing the seedbed often dry the soil enough to require pre-irrigation prior to planting.

In both tilled and stubble seedbeds, check surface and subsurface moisture to determine whether to pre-irrigate. Soils that have a moist subsurface profile to a depth of 14 to 16 inches provide optimum planting conditions for small grass and legume seeds. Having adequate subsoil moisture will reduce the risks of seedbed drying during forage seedling establishment.

Determine fertility requirements by soil sampling within each 40 acres of the field(s) to be planted to perennial forages. Fertilize according to soil test recommendations, applying all but the nitrogen or sulfur called for prior to seeding. Applying nitrogen at seeding will stimulate weed growth preferentially over grass seedling growth (legumes generally do not need nitrogen fertilization). For this reason and due to their mobility in soils, nitrogen and sulfur should be applied once the seedlings have become established in the spring following late summer plantings. Immobile nutrients, such as phosphorus, should be incorporated when tilling fields or knifed in bands across the stubble in no-till seedbeds. Soil testing labs will often call for 3 year's phosphorus requirements to be applied to fields being planted for hay production.

Seeding

Grasses and small seeded legumes are best seeded no deeper than one half inch. Most forage seeders have depth bands or some other means of regulating seed placement as well as press wheels to pack the soil over the small seeds. Grain drills are sometimes used but are not recommended because they don't control shallow seeding depth as well, especially in undulating or hilly ground. Apply light (one third to one half inch) irrigations frequently enough during the first few weeks to maintain moist soil at the seeding depth until the perennial forage seedlings have emerged. Reduce the irrigation frequency and increase the amount for the remainder of the fall growing season. Once seedling grasses or legumes have reached the three leaf growth stage, they have generally developed enough energy reserve to withstand drought and winter conditions.

Grass plots at Meeker. Photo taken by Calvin Pearson.

Wheat Seed Issues for Fall 2009

Brad Erker, CSU Extension and Colorado Seed Growers Association

- Seed treatment for wheat
- Good certified seed availability on established and new varieties
- Reminders about Certified seed and Plant Variety Protection

Seed Treatments - What a year 2009 was for the wheat crop. Excellent emergence conditions, followed by a very dry winter, put the crop in a precarious position going into April. Regular rains began in late April, however, and salvaged most fields. There should be good availability of Certified seed, with many exciting new varieties available. The most common questions this summer seem to be focused around diseases and seed treatments. Extra moisture allowed development of diseases we normally do not experience in our dry climate. Bruce Bosley has prepared an excellent review of the seed treatment decision process for this newsletter. I've had many discussions with Dr. Ned Tisserat, CSU's Plant Pathologist in the Department of Bioagricultural Sciences and Pest Management. Our takehome message is this: Treating seed with a fungicide is not necessary in all circumstances; it depends on what diseases were present in the field designated to be used for seed. Treat your seed if you've had a problem in the past with loose smut or covered smut – fields with more than 1-2 heads infected by these diseases per 10-20 feet of row should be treated. Treat if scab was severe (5-10% of heads). Use of seed treatments to lower incidence of dryland foot rot is debatable but could be tried in areas where this has been a consistent problem.

Certified seed availability - Wheat genetic providers continue to come out with strong new varieties to meet the needs of Colorado's farmers. We are fortunate to have continued strong breeding efforts of CSU and AgriPro here, and WestBred LLC is starting to have an impact on variety selection in Colorado now too. There are new varieties available in the categories of hard red winter wheat, hard white winter wheat, Clearfield, and varieties for Identity Preserved programs. Certified seed directories are mailed to each county extension office. You can also find the directory online at the Colorado Seed Growers Association website. Variety trial results of the CSU Crops Testing Program can also be easily accessed on the web. Finally, variety information can be obtained from the variety owners or accessing their sites listed below.

Resources:

http://seeds.colostate.edu/CSGA/csga.html [For CSGA Fall Directory]

www.csucrops.com [For variety trial results]

www.coloradowheat.org [CWRF varieties]

www.agriprowheat.com [AgriPro varieties]

www.westbred.com [WestBred LLC varieties]

PVP considerations for seed - Always remember to plant legal seed. The Plant Variety Protection Act (PVPA) encourages the development of new varieties by providing for the protection of the intellectual property rights of the owner. For wheat seed in Colorado, there are basically four categories:

1) Wheat varieties protected by PVP: These varieties must only be sold as a class of Certified seed. Farmers are allowed to save seed for use on their own farm. Examples include Hatcher, Jagalene, TAM 111, Ripper, Prairie Red.

2) Clearfield* wheats: These varieties are protected by patent as well as PVP. No saved seed is allowed, as part of the Stewardship program with the Clearfield* technology. Planting new Certified seed each year is part of the overall weed management strategy aimed at preventing the herbicide tolerance trait from transferring into jointed goatgrass. Examples include Above, Bond CL, and AP503 CL^2.

3) Identity Preserved wheats: New Certified seed is required each year in order to participate in these value-added programs. The PVP would allow saved seed to be used on grower's own farms, but the contract for the program requires Certified seed each year. Examples include Platte, Platte 2, NuGrain, Thunder CL.

4) Non-PVP'd wheats: These are varieties for which the PVP has expired, or which were released by a federally-funded group, such as USDA-ARS. Very few wheat varieties fall into this category. Examples include Lamar and TAM 107.

Precision Manure Management: It matters where you put your manure

Raj Khosla and Jessica Davis

"*Precision fertilizer management*" has been around for more than a decade and is practiced widely in Colorado and elsewhere. By precision, we mean application of fertilizer at the right time, in the right place, and in the right amount. Precision fertilizer application is usually based on grid soil sampling, analysis, and fertilizer recommendation, followed by variable rate fertilizer application. More recently, farmers have taken advantage of an approach using site-specific management zones that divides a field into management zones based on productivity potential and the zones are managed differently across the field.

Research conducted in Colorado particularly with nitrogen fertilizer, has clearly demonstrated that the best approach for variable rate fertilizer application is the "Variable Yield Goal" (VYG) nutrient management strategy. By VYG we mean, that the application of fertilizer is based on a unique yield goal appropriate for each management zone. This typically translates into relatively low rates of fertilizer on low-yielding management zones and high rates of fertilizer on high-yielding management zones. Such a precision fertilizer management strategy has shown to enhance (i) overall grain yield of the field, (ii) nutrient use efficiency, (iii) net $ returns to farmers and (iv) reduces overall nutrient losses from the field. The VYG nutrient management strategy builds upon a logical foundation, that we need to cut down fertilizers from historically non-productive or less productive areas (typically classified as low management zones) and reallocate the savings in fertilizers to the historically more productive areas (identified as high management zones) of the field. While such a strategy has multiple benefits and optimizes fertilizer application across the field, its scope is still limited in the eyes of a farmer. Logically so, because the VYG strategy does not address or improve the yield limiting factors of the low producing areas (or zones) of the field.

Figure 1. (Left to right: Tarp method of calibrating manure application).

Discussions with farmers led to an innovative idea of "*precision manure management*". The big question we had was: Could we strategically apply differential rates of manure across site-specific management zones such that they improve the yield of the low and medium producing areas of the field? Such a strategy implies (i) that we could improve grain yield of the low and medium producing areas (zones) of the field with manure applications and (ii) that we could have the same expectation in terms of grain yield from the entire field (i.e.) a "Constant Yield Goal" (CYG). A CYG manure management strategy would translate into applying relatively higher rates of manure on low management zones (to boost the productivity of those areas) and relatively low rates of manure on high management zones (to maintain the productivity of that area). In other words, our goal is to bring the grain yield of the entire field to the same level.

Recently, we completed three years of a "precision manure management" study at Colorado State University. We conducted experiments to evaluate the VYG and CYG precision manure management strategies along with the fertilizer based VYG precision fertilizer management strategy. The study was conducted on relatively heavy textured soil (clay loam to sandy clay loam) on a field in continuous corn that was furrow irrigated and received a limited number of irrigations (depending upon the availability of water during the growing season). The manure was applied and incorporated in the spring of each year. The manure application rates were 10, 20 and 30 tons/acre for low, medium and high management zones or vice-versa depending upon the precision manure management strategy (i.e.) VYG or the CYG. No additional nitrogen fertilizer was applied in any management zone.

Previous research by Dr. Khosla's group in Colorado has shown that low management zones typically have higher bulk densities and lower organic matter than high management zones. The findings from this research indicate improvements in the organic matter content and reduction in bulk density in the low management zones. Interestingly, the precision manure management brought organic matter content of the low zone almost to the levels of the high management zones in a period of three years. Both factors, higher organic matter and lower bulk densities, are known to increase grain yield and productivity potential.

In this study, grain yield response to application of variable rates of manure on low, medium and high management zones was evaluated for three years (2006, 2007 and 2008) under limited irrigation. Quite interestingly, in two (2006 and 2008) out of three years, the grain yield responded to variable rate manure application as expected. Grain yield did increase in the low management zones when a higher manure application rate (30 tons/acre) was applied. While, the grain yield response corresponded to our expectation, the grain yields were still lower than those observed for the precision nitrogen (fertilizer) management strategy for those two years (2006 and 2008). It is interesting to note that in 2007, with above normal precipitation, grain yield levels under precision manure management out performed the grain yield levels under precision fertilizer management in all the management zones.

What can we learn from this study? It matters where you apply manure within a field. However, manure alone applied at 30 tons/ac was not sufficient in two out of three years, to meet the complete crop nutritional needs. It is our understanding that nitrogen side-dressing based on either pre-sidedress soil nitrate test (PSNT) or in-season crop canopy sensing can be coupled with precision manure management to coincide and meet the peak nitrogen requirement of the crop. Previous research by Dr. Davis's group at CSU evaluated the timing of manure application. They found that fall-applied manure releases N in a pattern that coincides better with crop N requirements when compared to spring-applied manure, as was applied in this precision manure management study. However, there are environmental implications (e.g. snow melt run-off) of fall manure application. Hence, spring-applied manure coupled with additional side-dress N fertilizer application has potential to enhance both soil quality and productivity over time.

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