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Colorado State University® Cooperative Extension

FROM THE GROUND UP
Agronomy News

2003 Colorado Winter Wheat Variety Performance Trial Results

Performance trial results help Colorado wheat producers make better variety decisions.

Colorado State University, with the support and cooperation of the Colorado wheat industry, conducts annual dryland (UVPT) and irrigated (IVPT) variety performance trials to obtain unbiased and reliable information for Colorado wheat producers to make better wheat variety decisions. Good variety decisions can return millions of dollars to Colorado wheat producers.

The dryland UVPT was comprised of 66 entries grown at 10 locations. Of the 66 entries in this trial, approximately half were named varieties and the other half were experimental lines. In addition to CSU varieties and experimental lines, the trial included public varieties from Nebraska, Oklahoma, Kansas, and Texas, and private varieties from Cargill-Goertzen and AgriPro. A randomized complete block design with three replicates was used in all trials. Dryland trials were seeded at 600,000 seeds per acre, planted in 9 inch-spaced rows at Akron, Burlington, and Julesburg and 12 inch-spaced rows at the other locations.

The irrigated IVPT was conducted at Rocky Ford, Ovid, and Fort Collins. The irrigated trials are managed for

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Performance trial results help Colorado wheat producers make better variety decisions.

maximum yield and are seeded at 1.2 million seeds per acre with adequate fertilization to obtain or exceed 100 bushels per acre. The Ovid and Fort Collins trials were grown under sprinkler irrigation and the Rocky Ford trial was furrow-irrigated. All three irrigated trials provided excellent results. The Ovid trial was planted late to reflect results that might be obtained by planting winter wheat after harvesting corn in northeastern Colorado.

Planting conditions in the fall of 2002, following the severe drought, ranged from adequate to excellent except at the Bennett and Genoa locations where planting conditions were extremely dry. The trial at Bennett partially emerged after the late March (2003) snowstorm but resulting stands were highly variable. Emergence at Genoa was uniform but only about half the desired level. In spite of generally good emergence and top soil moisture conditions at the other locations, poor sub-soil moisture levels throughout eastern Colorado were prevalent. Adequate fall and winter precipitation was followed by a dry spring and moderate drought stress conditions at Walsh, Lamar, Sheridan Lake, Cheyenne Wells, Burlington, Genoa, and Orchard. The spring drought was aggravated by limited sub-soil moisture.

Russian wheat aphid pressure was higher this year than in recent years, especially in east-central and southeastern Colorado. A new Russian wheat aphid biotype was identified that overcomes the resistance in all RWA-resistant varieties released to date. Found in several places in eastern Colorado, it is feared that this new biotype (denoted as "biotype B") will spread throughout the region and replace the original RWA biotype (denoted as "biotype A"). Russian wheat aphid damage was observed at Walsh, Bennett, and Fort Collins with sporadic infestations observed at several other locations. Wheat steak mosaic virus and high plains disease were not observed at any locations and slight barley yellow dwarf virus symptoms were only observed at one location. Stripe rust, which had been so severe in 2001, was observed at the dryland trials at Julesburg, Akron, Burlington, Genoa, and Orchard and the irrigated trials at Fort Collins and Ovid. Infestation levels at these locations were relatively light except at Akron (dryland) and Ovid (irrigated) where yields of some highly susceptible entries were reduced significantly. Leaf rust was observed at very low levels at some locations. Temperatures were quite moderate statewide throughout May and June except one brief high temperature event in late May. High temperatures began in early July and affected some of the more northern trials during the last two weeks of grain filling. Low grain protein content, indicative of low soil nitrogen levels, were observed in some parts of the state that had above average yields.

Hail played a major role in reducing yields in 2003. Trials at Walsh, Lamar, Sheridan Lake, Cheyenne Wells, Genoa, and Orchard were damaged, to varying degrees, by early and late June hail events. Several locations received hail twice. These hail events led to more severe shattering than in previous years. All locations were harvested in 2003 but the UVPT summary table of results only includes six of the ten locations as emergence, drought, and hail conditions did not permit reliable variety yield comparisons at Bennett, Lamar, Sheridan Lake, and Genoa.

FROM THE GROUND UP

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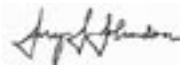
Web Site: http://www.colostate.edu/Depts/SoilCrop/extension/Newsletters/news.html



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Performance trial results help Colorado wheat producers make better variety decisions.

Jerry Johnson and Scott Haley
Extension Crop Production Specialist
and Wheat Breeder
Colorado State University

The following summary tables of results are designed to disseminate the essential information as quickly as possible to as many people as possible through the wheat industry, popular press, and DTN. More complete information for each trial, including performance of the Colorado experimental lines, will be available on the Internet at the following sites:

http://www.colostate.edu/Depts/SoilCrop/extension/CropVar/wheat1.html

http://wheat.colostate.edu/vpt.html

Colorado winter wheat 3-Yr and 2-Yr Uniform Variety Performance Trial summary.

	Averages						
Variety[1]	3-Yr	2-Yr	2003	2002	2001	3-Yr	2-Yr
	----------Yield (bu/ac)----------					--Twt (lb/bu)--	
Trego (HWW)	47.2	46.7 (3)	52.9	34.3	42.5	59.8	60.8
Enhancer	45.0	44.4	51.5	30.3	40.5	57.8	58.9
Stanton	45.0	43.8	49.4	32.6	41.1	58.4	59.9
Above (CL)*	44.5	46.7 (2)	52.8	34.5	37.3	57.4	59.0
Yuma	44.3	45.3 (5)	53.0	30.0	38.3	57.7	59.2
Alliance	44.3	44.5	50.5	32.5	39.1	57.8	59.2
Ankor	43.8	45.8 (4)	51.8	33.7	37.0	57.6	58.7
Jagger	43.8	41.3	46.0	31.7	41.5	58.1	59.2
Akron	43.7	44.1	49.6	33.2	38.4	57.7	58.8
Prairie Red	43.0	45.0	50.2	34.6	36.2	57.5	58.8
Avalanche (HWW)	42.8	44.1	50.4	31.6	36.7	59.2	60.6
Halt	42.8	42.7	46.7	34.7	38.1	57.4	58.6
Yumar	42.4	43.8	50.3	30.8	36.2	58.3	59.3
AP502 CL*	41.6	43.5	48.9	32.7	35.1	56.9	58.6
TAM 110	41.2	44.1	49.9	32.3	33.7	57.0	58.8
Prowers 99	41.1	40.9	45.4	31.8	36.8	59.5	60.3
Lakin (HWW)	40.8	43.2	47.8	33.9	33.9	58.3	59.3
2137	40.2	42.3	47.4	32.2	33.6	57.5	59.0
Venango	37.3	37.3	41.1	29.9	33.1	58.5	58.9
TAM 111	---	46.8 (1)	52.6	35.0	---	---	59.9
Jagalene	---	43.0	46.6	35.7	---	---	60.2
Ok101	---	42.8	48.8	30.9	---	---	59.2
Cisco	---	42.5	47.8	31.7	---	---	59.1
Thunderbolt	---	36.7	39.6	30.8	---	---	60.2

[1]Varieties in table ranked based on 3-Yr average yields.
[1.....5]Variety rank based on 2-Yr average yields.
CL - CLEARFIELD wheat variety.
HWW - Hard white winter wheat variety.

Performance trial results help Colorado wheat producers make better variety decisions.

Colorado winter wheat Uniform Variety Performance Trial summary for 2003.

	Location												2003			
	Akron		Burlington		Cheyenne Wells		Julesburg		Orchard		Walsh		Averages			
Variety[1]	Yield	Test Wt	Yield	Test Wt	Yield	Test Wt	Yield	Test Wt	Yield	Test Wt	Yield	Test Wt	**Yield**	% of Trial Average	Test Wt	Pt Ht
	bu/a	lb/bu	bu/a	lb/bu	bu/a	lb/bu	bu/a	lb/bu	bu/a	lb/bu	bu/a	lb/bu	**bu/ac**	%	lb/bu	in
Yuma	93.4	59.5	56.0	56.9	42.5	59.4	75.9	59.0	33.0	61.4	17.2	59.7	**53.0**	109	59.3	28
Trego	92.8	61.0	48.3	59.7	41.9	60.3	74.0	60.7	35.3	63.3	24.9	60.5	**52.9**	109	60.9	26
Above	93.1	59.6	46.0	57.0	41.0	58.8	72.4	59.1	39.2	59.1	25.0	59.9	**52.8**	109	58.9	27
TAM 111	101.3	60.8	46.5	57.8	41.4	61.1	72.6	59.1	35.4	62.8	18.7	60.2	**52.6**	109	60.3	28
Ankor	90.4	58.1	45.2	57.5	41.8	58.6	73.5	58.4	37.3	61.4	22.8	60.2	**51.8**	107	59.0	29
Enhancer	94.9	60.2	48.0	55.8	42.8	60.5	76.8	58.2	32.4	61.5	14.0	59.2	**51.5**	106	59.2	31
Alliance	92.2	59.5	42.7	56.6	39.3	60.9	74.2	58.8	34.4	61.9	20.4	58.9	**50.5**	104	59.4	27
Avalanche	89.9	61.0	47.7	58.7	42.3	60.5	65.4	60.7	34.4	61.8	22.9	61.1	**50.4**	104	60.6	28
Yumar	91.0	60.2	50.2	58.1	38.7	58.7	77.0	59.6	29.1	61.2	16.0	60.5	**50.3**	104	59.7	28
Prairie Red	88.5	59.2	48.8	56.9	40.7	57.2	68.2	59.0	32.3	61.4	22.6	59.2	**50.2**	104	58.8	28
TAM 110	87.2	58.1	44.3	56.6	41.0	58.0	71.9	59.5	33.8	60.7	21.6	59.5	**49.9**	103	58.7	27
Akron	88.4	59.4	46.3	57.7	42.6	58.8	67.5	58.6	33.4	60.5	19.5	59.3	**49.6**	103	59.0	28
Stanton	92.2	60.3	41.7	58.4	39.7	59.3	69.9	59.0	31.7	62.1	21.0	60.5	**49.4**	102	59.9	29
AP502 CL	87.6	59.4	43.5	56.9	39.2	58.7	71.4	59.4	31.1	60.4	20.6	58.6	**48.9**	101	58.9	28
Ok101	88.4	60.0	46.6	56.9	37.8	59.1	69.5	58.9	33.1	61.6	17.1	60.2	**48.8**	101	59.4	29
Cisco	88.9	60.5	48.3	56.6	37.5	57.9	57.2	59.6	32.5	60.5	22.4	60.4	**47.8**	99	59.2	28
Lakin	81.5	57.9	48.2	57.2	38.8	60.3	71.0	58.0	34.1	62.0	13.2	59.9	**47.8**	99	59.2	28
2137	85.7	59.3	45.8	58.0	38.0	59.0	71.5	59.4	30.2	61.3	13.1	59.1	**47.4**	98	59.4	27
Ok102	84.7	60.5	44.8	57.6	39.8	58.5	64.1	59.5	30.7	61.9	19.2	60.3	**47.2**	98	59.7	27
Halt	85.4	58.3	41.7	56.0	33.1	59.6	71.5	58.0	30.5	61.0	17.8	59.1	**46.7**	96	58.7	27
Jagalene	90.6	61.4	41.7	57.6	37.9	58.1	67.3	59.6	26.7	63.0	15.4	61.0	**46.6**	96	60.1	27
Jagger	93.2	60.6	44.2	56.0	33.4	58.8	62.2	58.9	30.8	60.9	12.4	60.0	**46.0**	95	59.2	29
Kalvesta	87.8	59.8	40.8	56.2	35.2	59.7	66.0	58.6	31.4	61.6	14.1	59.5	**45.9**	95	59.2	27
Prowers 99	83.3	61.4	40.0	58.0	40.2	61.5	62.2	60.5	31.4	62.2	15.2	60.4	**45.4**	94	60.7	32
G980091-1	85.1	59.7	39.7	56.4	28.7	58.8	66.5	58.3	33.0	60.6	10.8	59.4	**44.0**	91	58.9	26
Venango	81.2	59.7	33.4	55.8	27.9	59.0	68.6	59.1	29.3	*	6.0	60.2	**41.1**	85	58.8	28
Thunderbolt	78.0	61.2	35.3	58.2	26.5	59.8	61.0	59.9	28.1	62.5	8.8	61.0	**39.6**	82	60.4	27
Average	**88.8**	**59.9**	**44.7**	**57.2**	**38.1**	**59.3**	**69.2**	**59.2**	**32.4**	**61.5**	**17.5**	**59.9**	**48.4**	**100**	**59.5**	**28**
$LSD_{(0.30)}$	4.6		2.7		3.9		3.1		2.8		2.4					

[1]Varieties in table ranked by the average yield over six locations in 2003.

*Inadequate grain for test weight determination.

Colorado winter wheat Irrigated Variety Performance Trial summary for 2003.

	Location							2003				
	Fort Collins			Ovid		Rocky Ford		Averages				
Variety[1]	Yield	Test Wt	Protein Content[2]	Yield	Test Wt	Yield	Test Wt	**Yield**	% of Trial Average	Test Wt	Plant Ht	Lodging[3]
	bu/ac	lb/bu	%	bu/ac	lb/bu	bu/ac	lb/bu	**bu/ac**	%	lb/bu	in	1-9
Jagalene	128.0	60.4	14.2	100.6	57.6	116.8	59.3	**115.1**	116	59.1	37	4
Prairie Red	124.7	59.1	13.5	81.7	53.2	119.1	58.4	**108.5**	109	56.9	38	2
Wesley	113.1	57.6	15.3	91.7	58.2	116.6	60.0	**107.1**	108	58.6	35	1
Yuma	120.2	58.2	13.9	97.5	58.3	103.5	59.4	**107.1**	108	58.6	38	2
G980091-1	116.8	58.4	14.1	92.4	56.0	106.7	61.6	**105.3**	106	58.7	35	3
Cisco	119.9	60.6	14.2	88.3	57.9	101.0	58.4	**103.1**	104	59.0	38	3
Antelope	107.1	58.0	14.6	90.8	56.8	106.5	61.5	**101.5**	102	58.7	39	4
Ok101	115.2	58.9	13.3	79.8	53.1	107.7	59.4	**100.9**	101	57.1	39	3
G980122	117.4	58.9	15.6	78.3	54.4	105.6	60.5	**100.4**	101	57.9	38	2
Dumas	126.4	60.7	12.9	78.5	53.2	96.1	61.3	**100.3**	101	58.4	37	2
Platte	121.5	61.5	13.8	53.2	47.5	121.8	60.6	**98.8**	99	56.5	37	2
Kalvesta	116.8	59.3	14.7	74.7	52.9	101.3	60.7	**97.6**	98	57.6	39	2
2137	121.4	59.1	14.5	76.0	54.3	94.9	60.1	**97.4**	98	57.8	39	1
Ok102	113.8	58.9	15.1	73.9	54.0	101.0	60.4	**96.2**	97	57.8	38	1
Ankor	109.0	57.5	13.1	65.5	53.4	108.5	61.1	**94.3**	95	57.3	40	2
Venango	116.1	59.3	14.3	82.1	58.2	69.9	62.2	**89.4**	90	59.9	38	2
Arrowsmith	86.4	54.1	15.2	81.9	55.6	98.6	61.5	**89.0**	89	57.1	43	4
Nuplains	92.7	60.0	14.1	51.6	52.8	98.6	60.8	**81.0**	81	57.9	37	2
Average	**114.8**	**58.9**	**14.2**	**79.9**	**54.9**	**104.1**	**60.4**	**99.6**	**100**	**58.1**	**38**	**2**
Minimum			**12.9**									
Maximum			**15.6**									
$LSD_{(0.30)}$	7.6			9.4		6.8						

[1]Varieties in table ranked by the average yield over three locations in 2003.
[2]Protein contents adjusted to 12% moisture basis.
[3]Rating scale 1-9, with 1 = no lodging and 9 = completely lodged.

For past issues of the Agronomy News on agricultural topics such as:

- Colorado Pesticide Issues
- Drought
- Bio-pharming
- Forages
- Carbon Sequestration
- Beans
- Sensors in Agriculture
- Dryland Corn
- Biotechnology
- Metals and Micronutrients

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Colorado winter wheat 3-Yr and 2-Yr Irrigated Variety Performance Trial summary.

	Averages						
Variety[1]	3-Yr	2-Yr	2003	2002	2001	3-Yr	2-Yr
	----------Yield (bu/ac)----------					--Twt (lb/bu)--	
Wesley	102.8	100.6 (4)	107.1	91.0	108.2	59.8	58.9
Antelope (HWW)	99.7	95.6	101.5	86.9	109.7	60.1	58.8
Yuma	98.9	101.3 (3)	107.1	92.6	92.9	59.4	58.3
Prairie Red	98.5	103.1 (2)	108.5	94.9	87.0	58.5	57.5
2137	88.2	90.4	97.4	79.8	82.9	58.9	58.0
Venango	85.8	83.9	89.4	75.8	90.4	60.8	60.0
Nuplains (HWW)	83.2	84.4	81.0	89.5	80.3	59.7	58.8
Jagalene	---	106.1 (1)	115.1	92.5	---	---	59.4
Platte (HWW)	---	97.6 (5)	98.8	95.8	---	---	58.0
Ok101	---	97.4	100.9	92.2	---	---	57.2
Dumas	---	93.9	100.3	84.3	---	---	59.6
Ankor	---	92.1	94.3	88.8	---	---	56.7

[1]Varieties in table ranked based on 3-Yr average yields.

[1.....5]Variety rank based on 2-Yr average yields.

HWW - Hard white winter wheat variety.

"Changing Sciences for a Changing World: Building a Broader Vision"

2003 ASA-CSSA-SSSA Annual Meetings

November 2-6, 2003
Colorado Convention Center
Denver, Colorado

American Society of Agronomy (ASA)-Crop Science Society of America (CSSA)-Soil Science Society of America (SSSA) bring together 4,000+ people from 40 countries representing academia, government and private industry, including a large contingent of undergraduate and graduate students.

This year's theme is: "Changing Sciences for a Changing World: Building a Broader Vision." Over 2,800 symposia and paper/oral sessions will cover such topics as plant genomics, turfgrass science, soil mineralogy, and integrated agricultural systems. The event also features exhibits, a career fair, guided tours, companion activities and childcare.

Opportunities for Certified Crop Advisors to earn Continuing Education Units.

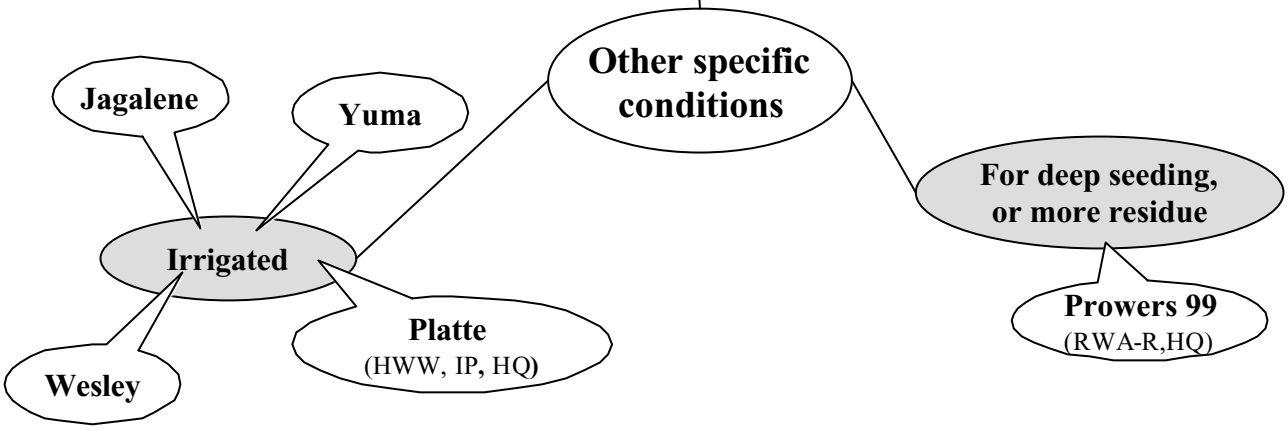
http://www.asa-cssa-sssa.org/anmeet/preregistration.pdf

Decision Tree for Winter Wheat Variety Selection in Colorado

Jerry Johnson and Scott Haley *(August 2003)*

High Performance Varieties for Dryland Eastern Colorado

Above **(CL)** •*CLEARFIELD** •High, stable yielding HRW •2001 CSU release •Can't save seed!	Trego **(HWW)** •High, stable yielding •High test weight •Leaf rust resistance •1999 KSU release Avalanche **(HWW)** •High yielding •Trego sister selection, slightly earlier, taller •2001 CSU release	Enhancer **(HRW)** •High yielding 1998 Cargill-Goertzen release •Good growth/row cover •Stripe rust resistance TAM 111 **(HRW)** •High yielding •Agripro wheat variety •Taller semidwarf •Stripe rust resistance •HQ release 2002	Stanton **(RWA-R)** •High yielding HRW •Taller semidwarf •Leaf rust resistance •2000 KSU release Ankor **(RWA-R)** •High yielding HRW •Like Akron, higher yield •Better baking quality •Good growth/row cover •2002 CSU release



(HQ) high end-use (milling and baking) quality.

(HWW) Hard White Winter wheat variety.

(HRW) Hard Red Winter wheat variety.

(CL) herbicide-tolerant CLEARFIELD* wheat variety.

(RWA-R) resistant to Russian wheat aphid (biotype A).

(IP) a variety that is identity-preserved, produced on contract, and eligible for bonus payment based on contract criteria.

The best combination of winter wheat varieties in Colorado depends upon variable production conditions. Production risks may be reduced by planting two or more varieties. The decision tree is based on variety performance, quality assessments, and agronomic observations in CSU variety trials and collaborative on-farm tests over a period of two or more years.

2002/2003 Collaborative On-Farm Tests (COFT)

Introduction

This year, over half (57%) of Colorado's wheat acreage was planted to winter wheat varieties that have been tested in the COFT program which is in its' sixth year of testing. With on-farm testing, wheat producers evaluate new varieties on their own farms before seed of the new varieties is available on the market to all farmers. On-farm testing directly involves agents and producers in the variety development process, thereby speeding adoption of superior, new varieties. COFT growers sometimes see some variety characteristic that was not recognized before COFT testing. Agents get experience with new varieties before the varieties are commonly available and share this experience with all their client growers. The whole wheat community benefits from reliable and unbiased COFT results.

Colorado State University Cooperative Extension agents have a large responsibility for the success of this program -recruiting volunteer growers, delivering seed, planning test layout and operations, helping with planting, keeping records, coordinating visits, communicating with growers and campus coordinators, coordination of weighing plot and measuring yields and collecting grain samples for quality analyses. COFT would not be possible without the collaboration of so many dedicated and conscientious wheat producers throughout eastern Colorado. The success of the COFT program in 2003 was also due to the long hours of hard work by our Cooperative Extension agents listed in the table below.

In the fall of 2002, thirty-one eastern Colorado wheat producers planted collaborative on-farm tests (COFT) in Baca, Prowers, Lincoln, Kit Carson, Washington, Phillips, Sedgwick, Logan, Morgan, Adams, Arapahoe, and Weld counties. Working alongside local Extension agents, each producer/collaborator received 100 pounds seed of each variety and planted the six varieties in side-by-side strips. The objective was to compare performance and adaptability of newly-released varieties. Comparisons of interest were:

- Compare Russian wheat aphid resistant, **Ankor**, with non-resistant parent, **Akron**.
- Compare high yielding KSU hard white wheat, **Trego**, with CSU sister line selection, **Avalanche**.
- Ascertain relative performance and wide spread adaptability of high yielding *CLEARFIELD** wheat variety, **Above**.
- Ascertain relative performance and wide spread adaptability of high yielding Cargill-Goertzen hard red winter wheat variety, **Enhancer**.

An important additional objective of the 2003 COFT tests is being carried out by Federico Pardina, a CSU graduate student supported by the Colorado Wheat Research Foundation, who is mapping eastern Colorado for COFT wheat variety yield and quality characteristics. Two pound grain samples of each variety were collected at all COFT tests and will be used for mapping Colorado for multiple wheat quality characteristics.

Results

Each test suffered from one or more of the causes for reduced wheat yields in 2003: poor/uneven stand establishment, Russian wheat aphid infestations, fall or spring drought, stripe rust infestation, and hail. Spring drought and hail were the most important factors affecting yields in 2003. Conclusions should not be drawn from a single on-farm test. The 2003 COFT results are divided into three geographic regions primarily for ease of understanding the results. There were statistically significant differences in yield among varieties in all three regions and in the overall average yields, although the yield differences were not great.

- Ankor, the RWA-resistant derivative from HRW Akron, performed better than Akron in all regions and in the overall yield comparisons.
- Avalanche performed better, by comparison to Trego, in COFT tests than in the smallplot trials. The 2003 results indicate that Avalanche performed as well or better than Trego in southeastern Colorado and along the Front Range while Trego performed better than Avalanche in Northeastern Colorado.

2002/2003 Collaborative On-Farm Tests (COFT)

- Above (HRW), the *CLEARFIELD** wheat variety, performed well in all the regions and was one of the best overall performers. Above can be planted for yield performance alone but certified seed must be purchased annually and can not be kept for seed in another year.
- Enhancer (HRW), a 1998 release from Cargill-Goertzen, was a top performer in northeastern Colorado and along the Front Range and was one of the top two performing varieties in the overall averages.

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Summary about Wheat Profiles

Crop Profiles provide information based on specific commodities describing regional or state-specific production systems including crop production methods and pest management strategies. This detailed information about crop production is used by EPA for pesticide decisions and by the state to develop pest management strategic plans. It is the intent that Profiles provide the production story for a commodity to include current pest management practices as well as look at current research activities directed at finding replacement strategies for pesticides of concern. The Profiles are avenues for stakeholders associated with a specific crop to provide experienced information directly to EPA decision makers.

Food Quality Protection Act of 1996 instructs USDA and EPA to obtain pesticide use and usage data on the major and minor crops. Many currently used pesticides will come under review in the next few years, these same pesticides are vital to the production of many crops. Because some of these uses may be modified or canceled it is important to identify where pest management stands now, where we need to be in the future, and what research efforts are needed to get us there as far as pest management practices are concerned.

To view the most recent wheat crop profile for Colorado or to learn more about crop profiles in general please visit: http://www.colostate.edu/Depts/SoilCrop/extension/CEPEP/profiles.htm.

Eastern Colorado Cooperative Extension Wheat Educators and On-Farm Test Coordinators

Name	Title	Office Location
Bruce Bosley	Platte River agronomist	Sterling
Tim Macklin	Southeast Area agronomist	Lamar
Ron Meyer	Golden Plains agronomist	Burlington
Tim Burton	Cheyenne County agent	Cheyenne Wells
Thaddeus Gourd	Adams County agent	Brighton
Jerry Alldredge	Weld County agent	Greeley
Gary Lancaster	Sedgwick County agent	Julesburg
Leonard Pruett	Southeast Area leader	Lamar
Dwight Rus	Lincoln County agent	Hugo

Colorado Collaborative On-Farm Test (COFT) results in 2003.

Test Location	Variety (Yields in bu/ac @ 13% moisture)						
County	**Akron**	**Ankor**	**Avalanche**	**Trego**	**Above**	**Enhancer**	**Avg**
Adams-K1	17.2	18.2	19.8	19.6	20.2	20.7	19.3
Adams-K2	12.6	11.9	14.9	12.1	14.9	15.2	13.6
Adams-S	52.7	51.6	46.1	47.8	52.0	52.3	50.4
Weld-C	35.2	43.6	33.1	31.7	38.4	35.9	36.3
Weld-W	24.5	30.1	26.3	25.4	27.0	29.9	27.2
Weld-Wh	33.1	34.7	35.0	30.5	34.8	30.1	33.0
Front Range Avg	**29.2**	**31.7**	**29.2**	**27.9**	**31.2**	**30.7**	**30.0**
*** $LSD_{(0.30)}$**	**b**	**a**	**b**	**b**	**a**	**a**	
County	**Akron**	**Ankor**	**Avalanche**	**Trego**	**Above**	**Enhancer**	**Avg**
KitCarson-D	34.5	37.6	37.0	39.1	39.4	45.8	38.9
Lincoln-H	18.9	20.2	20.5	18.2	14.0	22.4	19.0
Lincoln-M	38.9	38.5	38.4	37.9	42.1	43.4	39.9
Lincoln-O	60.0	62.6	60.8	66.5	59.9	54.1	60.7
Lincoln-S	47.6	48.0	46.4	51.6	53.9	49.3	49.5
Logan-A	44.5	43.7	46.2	48.6	53.9	49.2	47.7
Logan-B	28.6	29.8	29.5	28.3	28.7	29.9	29.1
Logan-G	33.2	34.8	33.9	34.9	36.9	36.4	35.0
Logan-N	59.1	53.7	54.9	58.8	59.4	60.2	57.7
Morgan-M	34.3	37.7	30.6	35.3	35.2	38.0	35.2
Sedgwick-D	60.1	61.0	63.1	59.4	62.5	60.7	61.1
Sedgwick-P	37.7	38.8	38.0	35.5	40.9	40.3	38.5
Washington-W	37.5	46.7	41.8	44.6	35.4	51.3	42.9
Northeast Avg	**41.1**	**42.5**	**41.6**	**43.0**	**43.2**	**44.7**	**42.7**
$LSD_{(0.30)}$	**d**	**bc**	**cd**	**b**	**b**	**a**	
County	**Akron**	**Ankor**	**Avalanche**	**Trego**	**Above**	**Enhancer**	**Avg**
Baca-B	40.8	41.7	43.0	42.6	42.1	42.1	42.1
Baca-H1	23.8	28.8	26.3	30.0	30.4	36.9	29.4
Baca-H2	26.3	27.6	26.3	26.7	28.5	29.4	27.5
Baca-L	25.3	27.3	28.3	30.3	31.4	19.2	27.0
Baca-S	17.2	19.8	20.2	14.1	17.5	15.4	17.4
Baca-W1	46.6	44.5	51.0	40.3	43.0	51.1	46.1
Baca-W2	23.9	29.4	31.2	30.1	29.1	27.1	28.5
Cheyene-S	20.9	20.9	16.3	19.7	17.2	18.0	18.8
Prowers-H1	46.4	44.5	51.3	42.1	37.7	37.8	43.3
Prowers-H2	18.5	17.6	23.1	17.8	28.9	22.1	21.3
Prowers-S	38.0	33.9	36.1	32.8	38.7	27.5	34.5
Southeast Avg	**29.8**	**30.5**	**32.1**	**29.7**	**31.3**	**29.7**	**30.5**
$LSD_{(0.30)}$	**bc**	**abc**	**a**	**c**	**ab**	**c**	
	Akron	**Ankor**	**Avalanche**	**Trego**	**Above**	**Enhancer**	**Avg**
Overall Average	**34.6**	**36.0**	**35.7**	**35.1**	**36.5**	**36.4**	**35.7**
$LSD_{(0.30)}$	**c**	**a**	**ab**	**bc**	**a**	**a**	

*Varieties with different letters indicate statistically different mean yields using a Least Significant Difference test with alpha = 0.30.

Estimating Landscape-Level Gene Flow in Wheat and Jointed Goatgrass

A major concern with genetically engineered (GE) crops is that the introduced genes will spread via pollen to conventional varieties of that crop or to related wild species. This could potentially result in marketing problems for conventional wheat, or negative environmental effects if the genes spread to wild species. Because GE wheat cultivars may be released within the next few years, knowledge of landscape-level gene movement from GE wheat will be important information for regulatory agencies and for growers. We have undertaken a three-year project to estimate gene flow from landscape-level (i.e., commercial-scale) wheat fields, taking advantage of the 2002 first-time commercial planting of a *CLEARFIELD** (imazamox herbicide tolerant) winter wheat variety in Colorado. To fund this work we were recently awarded a grant from USDA's Biotechnology Risk Assessment Research Grants Program.

Our specific objectives are (1) to evaluate landscape-level crop-to-crop gene flow in wheat, using as a marker trait imazamox herbicide tolerance in the newly released wheat cultivar 'Above'; (2) to evaluate landscape-level gene flow from 'Above' wheat to jointed goatgrass and to wheat x jointed goatgrass hybrids, based on imazamox herbicide tolerance; and (3) to compare gene movement in landscape-level evaluations to gene movement in smaller-scale research plots in similar environments.

"Jointed goatgrass (L) and wheat (R)"

Photo credit: Tom Whitson, Univ. of Wyoming.

In each of three years, we hope to identify 20 locations in eastern Colorado where 'Above' is planted next to non-*CLEARFIELD** varieties. Heading dates will be monitored for 'Above' and the adjacent varieties to verify the likelihood of cross-pollination. At harvest, grain samples will be collected at four distances from the edge of the 'Above' field: 0 (or as close as possible), 30, 60, and 120 feet. Wherever possible, seeds of jointed goatgrass will be collected from the same fields and sampling distances as the wheat seed. After threshing, herbicide tolerance of the samples will be evaluated by germinating seeds in an imazamox solution. Surviving seedlings most likely received the herbicide tolerance trait through cross-pollination with 'Above'. To confirm herbicide tolerance, seedlings that grow in the presence of imazamox will be transplanted into potting mix, grown in the greenhouse to the 3-4 leaf stage, and sprayed with imazamox. Percent imazamox tolerance (and therefore, percent cross-pollination) will be calculated as the number of survivors divided by the total number of germinated seeds.

We appreciate the excellent collaboration we received from growers and extension agents this past season, and hope to expand those collaborations in the coming years.

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A New Russian Wheat Aphid

Background

Prairie Red is a Russian wheat aphid resistant version of TAM 107, which was released by CSU in 1998. It has been a popular variety in parts of the state with consistent Russian wheat aphid problems. Resistance in this variety is due to the gene Dn4. Other varieties with this resistance gene include Ankor, Halt, Prowers 99 and Yumar. In addition, Stanton is also resistant but is thought to have a different gene. Combined, these varieties account for about one fourth of the wheat acres in Colorado.

Situation

Russian wheat aphid infestations in Prairie Red have been common this season in southeast Colorado. Additional reports of infestations in other resistant varieties have been received from elsewhere in the state. Plants have susceptible symptoms, rather than a large number of aphids on a plant with resistant symptoms.

Russian wheat aphids were collected from infested Prairie Red and placed on seedlings of resistant and susceptible varieties in the greenhouse. We observed a susceptible reaction on all varieties when we used aphids from infested Prairie Red, but we observed the expected resistant and susceptible reactions when we used aphids from our greenhouse colony (Tables 1 and 2).

Our initial conclusion is that there is a new biotype of Russian wheat aphid in Colorado that is virulent to varieties containing Dn4 and Stanton. There are many questions that need to be answered about how this might have occurred and what needs to be done about it.

What we know

1. We have the original biotype (Biotype A) of the aphid.

2. We have a new biotype (Biotype B) of the Russian wheat aphid. This is not a completely unexpected development, but there was no way to prepare for it because we could not identify which sources of resistance to use in new varieties. One exception was a report of a different biotype in Chile, and we had already taken some preliminary steps to prepare for its possible arrival.

3. Our resistant varieties are effective against Biotype A and susceptible to Biotype B.

4. Biotype B infestations will need to be managed conventionally on all Colorado varieties. This means that the crop will need to be scouted and treated with an insecticide if economic thresholds are exceeded.

5. Other management tactics such as biological control and cultural practices should be equally effective against both biotypes.

6. Russian wheat aphid must be managed with a combination of management tactics if we are to avoid future biotypes. Complete management recommendations are available at http://www.highplainsipm.org/ and http://www.ext.colostate.edu/pubs/insect/05568.html.

What we don't know

1. What sources of resistance can we use in future resistant varieties? There may be genes effective against both biotypes, or it may be necessary to develop varieties with a gene for each biotype. Our first test of new sources of resistance is underway.

2. Are the two biotypes different only in their virulence to our resistant wheats, or are there other important biological or economic differences that might affect other management recommendations?

3. Where did Biotype B come from? One possibility is that it adapted locally to our resistant varieties. The other possibility is that it is the result of a new introduction from another country. Many Russian wheat aphid biotypes are known to exist elsewhere in the world. Genetic studies by USDA-ARS are underway to answer this question.

4. How do we tell the two biotypes apart? Currently we can field collect aphids from damaged resistant plants and be fairly certain that we are collecting Biotype B. Also, we can collect from damaged susceptible plants and test aphids on seedlings in the greenhouse. However, neither of these procedures provide the rapid, cheap answers we may need to make management decisions.

5. Will the distribution of Biotype B be different from that of Biotype A?

A New Russian Wheat Aphid (continued)

Table 1. Leaf rolling and plant damage scores for two Russian wheat aphid biotypes on seedlings of susceptible wheats, Dn4-resistant wheats and Stanton, May, 2003.

	Biotype A		Biotype B	
Variety	Leaf Rolling[1]	Plant Damage[2]	Leaf Rolling[1]	Plant Damage[2]
Akron	2	6	3	9
Ankor	2	3	3	9
TAM-107	3	8	3	9
Prairie Red	2	3	3	8
Yuma	2	7	3	9
Yumar	1	2	3	8
Halt	1	2	3	8
Stanton	2	3	3	9
Carson	3	8	3	9
Average for susceptible varieties	2.5	7.3	3.0	9.0
Average for resistant varieties	1.6	2.6	3.0	8.4

[1] 1 - 3 leaf rolling scale, where 1 = no leaf rolling and 3 = tightly rolled leaves.
[2] 1 - 9 plant damage scale, where 1 = no damage and 9 = dead plant.

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South Platte River Conference

Examines Water Quality, Quantity and Related Issues

Raintree Plaza Conference Center
Longmont, Colorado
Oct. 24-25, 2003

In addition to examining water quality and quantity, the forum will cover conservation and reuse efforts, current legislation, water banking, studies and popular opinion affecting the basin and well augmentation.

Keynote speakers include Russell George, Colorado Division of Wildlife director; Ralph Morgenweck, U.S. Fish and Wildlife Service regional director; and Colorado Sen. John Evans.

To register or for more information, contact Jennifer Brown, forum coordinator, at 970-213-1618 or southplatte@qwest.net. Registration is $85.

Weed Science Update

Colorado Wheat Field Tours

The Weed Science group at Colorado State University participated in the Colorado Wheat Field Days during June, 2003. Information was provided to area farmers on new herbicides and their use in winter wheat. Greatest interest was generated when the discussion focused on *CLEARFIELD** Wheat. *CLEARFIELD** Wheat variety 'Above' was developed by BASF and Colorado State University. Above is the first imidazolinone tolerant wheat line introduced into the winter wheat market. Above wheat is used in combination with Beyond herbicide. Beyond herbicide provides selective control of winter annual grasses such as downy brome, jointed goatgrass, and feral rye. Time of application on feral rye is critical in order to achieve optimum weed control. Recommendations are to treat feral rye in the 1-3 leaf stage prior to tillering. Jointed goatgrass can be treated in the fall or spring. Beyond herbicide can be applied from 4-8 oz/A in combination with nonionic surfactant (NIS) and urea ammonium nitrate (UAN).

Implementation of Best Management Practices for Management of Jointed Goatgrass

The National Jointed Goatgrass Research Program has funded several large scale, on farm trials in the Great Plains for economic analysis and demonstration of current practices compared to new integrated approaches. Two large-scale projects are located in Otis and Haxtun, CO. The studies were initiated in the fall of 2000 and will continue until 2007. The study objectives are to examine the use of *CLEARFIELD** technology in combination with corn, millet and sunflower rotational crops in effort to manage jointed goatgrass populations. Wheat yields in 2003 were 39 and 32 bushels/A at Otis and Haxtun, CO, respectively for Beyond herbicide treated *CLEARFIELD** wheat. Conventionally treated *CLEARFIELD** wheat yields were 35 and 32 bushels/A at Otis and Haxtun, CO, respectively. Corn, millet, and sunflower have yet to be harvested.

Beyond Herbicide - Winter Annual Grass Greenhouse Dose Response Study

Greenhouse studies were conducted from 2000-2003 to examine winter annual grass response to Beyond herbicide applied at 10 application rates and 3 growth stages. Herbicide application rates ranged from 0.0005 – 0.256 lb ai/A. Winter annual grass growth stages were 2-3 leaves, 1-2 tillers and 3-5 tillers. Study results show that jointed goatgrass is more susceptible to Beyond herbicide, followed by downy brome and feral rye. The results observed in the greenhouse studies confirm results observed in field trials. These greenhouse studies provide information that can be used to make more precise label recommendations.

In vivo ALS Assay

It is not known how rapidly ALS (acetolactate synthase) activity recovers in *CLEARFIELD** winter wheat after application of imazamox. In addition, the development of resistance in winter annual grasses is also a concern. We want to determine if an in vivo ALS assay could be used to measure the recovery of ALS in *CLEARFIELD** wheat as well as to monitor ALS activity in the winter annual grasses. Studies were conducted to measure ALS activity in *CLEARFIELD** wheat, susceptible wheat and in winter annual grasses using an in vivo bioassay. Dr. Dale Shaner designed an assay using plant leaf disc to measure ALS activity. Leaf discs are placed in vials containing a solution that aids in the release of the ALS enzyme. The process takes approximately 24 hours to gather the results. Although the assay is still in the developmental stage, early results indicate the assay can detect resistant and susceptible plants in the field. With assistance from Colorado State University, farmers might be able to use the assay to determine if resistant weeds have developed from the use of ALS herbicides.

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Wheat Information on the Web

Agriculture Network Information Center
http://www.agnic.org/

American White Wheat Producers Association
http://www.awwpa.com

BASF's Clearfield Website
http://www.clearfieldsystem.com/

Colorado Wheat Variety Performance Database
http://triticum.agsci.colostate.edu/vpt.html

Crop Profile for Wheat (Winter) in Colorado
http://pestdata.ncsu.edu/cropprofiles/docs/cowheat-winter.html

Crop Variety Performance for Colorado Crops
http://www.colostate.edu/Depts/SoilCrop/extension/CropVar/index.html

CSU Crop Production Factsheets
http://www.ext.colostate.edu/pubs/crops/pubcrop.html

CSU Dryland Ecosystems Project
http://www.colostate.edu/Depts/SoilCrop/dryland/dryland.htm

Hard Winter Wheat Regional Nursery Program
http://www.ianr.unl.edu/arslincoln/wheat/default.htm

IFAFS - Bringing Genomics to the Wheat Fields
http://maswheat.ucdavis.edu/

USDA-ARS Western Wheat Quality Lab
http://www.wsu.edu/~wwql/php/index.php

Wheat Diseases and Pests Identification Guide
http://wheat.pw.usda.gov/ggpages/wpest.html