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FROM THE GROUND UP

Agronomy News

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Colorado State University Cooperative Extension

Putting Knowledge to Work

2005 Colorado Winter Wheat Variety Performance Trial Results

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

Colorado State University provides unbiased and reliable information to Colorado wheat producers to help them make better wheat variety decisions. CSU's dryland and irrigated variety performance trials are made possible by the support and cooperation of the Colorado wheat industry. Wheat variety performance trials represent the final stages of a wheat-breeding program where experimental lines are tested under a broader range of conditions than is possible earlier in the program. On-going and strong support for a public breeding program, like that at CSU, is important because the varietal development process is long and testing for yield superiority and stability under highly variable Colorado conditions is a great challenge. There is large annual variation in precipitation as well as variable fall, winter, and spring temperature regimes that interact with variety maturity to affect wheat yields. In recent years, we have seen a variable and evolving wheat disease situation with stripe rust and wheat streak mosaic virus. There have always been large fluctuations in weed infestations from one year to another, and we have witnessed the recent rapid onset of new Russian wheat aphid biotypes over the past two years.

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

Topsoil moisture conditions were good throughout the state in fall 2004 and planting was earlier than normal in almost all locations. Plant stands were excellent in most trials and growth continued into late fall. Trials across eastern Colorado experienced late fall infestation of leaf rust, which was highly unusual for Colorado and especially for southeast Colorado. Not recognized in the fall, the early planting and favorable `green bridge` conditions likely favored the growth and spread of wheat curl mite populations responsible for transmitting the wheat streak mosaic virus. Damage from wheat streak mosaic virus became evident in the spring of 2005 when temperatures increased.

The mild 2004-2005 winter did not reduce wheat stands, nor did it reduce overwintering Russian wheat aphid (RWA) or wheat curl mite. Leaf rust was found to over winter in many eastern Colorado locations while the fall stripe rust infection at Fort Collins did not over winter. Moisture was sufficient from January-April to maintain the luxuriant growth resulting from excellent fall emergence and growth. The numbers of tillers per plant, throughout eastern Colorado, were extraordinarily high by the end of April 2005. During the last week of April, around April 27-28, there were several nights with below freezing temperatures and, in some places, 10 or more hours below 26 degrees F. The freeze damage that may have occurred was likely most restricted to southeast Colorado where the wheat was well past jointing and the growing point was far above ground level.

Colorado wheat producers, and our variety performance trials, were to suffer several more blows in May that were much more damaging than the April freeze. The largest setback to yield performance in our trials was a period of drought stress from late April to early May followed by a period of high temperatures, often accompanied by dry winds, later in May. The drought and heat stress, which was relieved later by precipitation and more moderate temperatures, arrested growth and resulted in shorter than normal wheat in most places. Heat stress may have been the cause in some places because it appeared that sufficient soil moisture was present but high air temperatures combined with luxuriant plant growth appeared to have made it difficult for the plant to get water to developing heads, resulting in aborted kernels and partially or fully dead heads and stunted plant growth. Two trials with poor fall emergence and the poorest overall stands, Genoa and Arapahoe, exceeded our expectations in growth and yield.

Stripe rust infections affected large areas of wheat production in Colorado and surrounding states in 2005. Mild winter temperatures allowed stripe rust to over winter in Texas and build up to high populations in early spring in the Texas and Oklahoma Panhandle regions. Spring storms quickly spread stripe rust spores north where cool, wet weather conditions were favorable for infection and spread of the disease. Infections were observed in southeast Colorado by early May, likely aided by the luxuriant growth that was similar to irrigated wheat conditions where stripe rust has been more common in Colorado. The drought stress in early May delayed the spread of stripe rust further to the north but rains that came in early June then caused heavy stripe rust infection in many areas north of I-70. Overall, stripe rust was much more severe than usual in many areas of eastern Colorado in 2005 and resulted in significant yield reductions in some susceptible wheat varieties. The epidemic was a result of a combination of favorable environmental conditions and genetic

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FROM THE GROUND UP
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susceptibility of most available wheat cultivars.

The consensus is that stripe rust is not likely to be a serious problem every year in Colorado. This is because conditions that favor disease development (i.e., extended periods of cool, wet weather) are not common in the High Plains region. Nevertheless, stripe rust has developed to some extent three times in the past five years in Colorado. Thus, growers who plant susceptible varieties should be aware of the potential risk and should consider the possibility of preventive spring fungicide applications on irrigated or high-yield potential wheat if stripe rust is present.

Wheat streak mosaic virus was also severe in some locations in east central and northeastern Colorado. The wheat streak mosaic epidemic, caused by a virus transmitted by the wheat curl mite, was a result of a combination of factors. This included carry-over of mites in late summer on volunteer wheat, corn and other hosts, early fall planting dates, mild fall temperatures that allowed for mite buildup and transmission of the virus, and drought conditions in late winter and early spring that further damaged infected plants. The wheat streak mosaic virus outbreak in 2005 is a good reminder of the potential danger of early planting dates and failure to control volunteer wheat.

The new form of the Russian wheat aphid, designated as "biotype 2", was found throughout eastern Colorado and caused yield losses in varieties that carry resistance to the original biotype of RWA (designated as "biotype 1"). RWA infestations were early and widespread in 2005. Infestations of RWA were observed at several trial locations though the damage was likely over-shadowed by the drought and high temperatures in May. Southeastern Colorado wheat producers may have suffered more loss, and sprayed more than other places in Colorado.

Weed control was problematic for some producers. Fall moisture stimulated winter annual weed growth like wheat and volunteer rye, downy brome, jointed goatgrass, and tansy mustards which were quite evident and problematic where they were not controlled.

In summary, all or most of the above climatic or biotic factors affected each of our performance trials this year. In some cases the factors were interacting, such as the promotion of stripe rust infection as a result of the luxuriant spring growth which also led to increased drought susceptibility. It is very difficult to determine which factor had the most influence on trial yields at each location. Variety maturity also interacted with some of the factors above, independent of variety performance. For example, later maturing varieties suffered significantly from the hot, dry winds that occurred later in May when these varieties were coming out of the boot. The conclusion is that producers are encouraged not to consider single-location results for variety selection but rather to use the summary of performance of all 2005 locations in addition to the 2-year and 3-year summaries.

Ten dryland and three irrigated variety performance trials were harvested and the results are presented below. The dryland trial at Orchard was lost due primarily to the heat/drought stress cited above. There were fifty-two entries in the dryland performance trial and thirty-four entries in the irrigated trial. Both trials include a

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Colorado winter wheat Uniform Variety Performance Trial summary for 2005.

	Location										2005 Averages				
Variety[1]	Akron	Arapahoe	Bennett	Burlington	Genoa	Julesburg	Lamar	Sheridan Lake	Walsh	Yuma	2005	% of Trial Average	Grain Moist[2]	Test Wt	Plant Ht[3]
	Yield (bu/ac)											%	%	lb/bu	in
Bond CL	33.5	30.5	41.3	34.5	66.2	28.4	37.5	27.1	60.3	30.7	39.0	125	10.1	56.4	22
CO00016*	31.3	34.6	37.3	35.0	53.1	31.9	44.9	38.4	57.4	25.0	38.9	125	10.4	56.9	23
Hatcher	26.7	24.3	35.3	14.8	66.2	33.4	43.5	30.4	65.0	18.0	35.8	115	10.6	57.6	20
Enhancer	28.6	25.7	37.6	27.1	59.4	26.0	44.0	24.9	57.4	24.5	35.5	114	10.3	55.3	25
HV9W98-143	26.6	20.9	36.9	17.6	72.5	28.1	37.4	20.3	51.7	25.1	33.7	108	10.9	56.2	24
AP502 CL	25.5	23.3	36.5	29.7	54.5	29.8	33.6	30.9	44.2	24.3	33.2	107	10.0	57.5	23
Prairie Red	26.6	25.0	40.7	25.4	57.8	32.3	35.1	25.1	46.0	17.4	33.1	106	10.3	57.6	21
Above	27.1	30.6	33.7	24.3	60.0	27.9	34.7	28.2	45.4	19.5	33.1	106	10.5	58.2	21
Jagalene	22.2	18.8	31.4	19.7	63.5	35.0	40.3	24.0	50.5	25.2	33.1	106	10.5	57.2	23
Avalanche	26.4	19.1	36.3	18.9	57.8	33.9	40.6	28.2	43.4	25.2	33.0	106	10.7	58.5	23
Jagger	31.2	25.8	26.6	19.8	66.8	28.9	32.8	16.8	53.5	25.1	32.7	105	10.2	56.4	23
GM10006	28.6	15.3	35.4	22.1	63.8	31.9	38.3	21.6	45.9	21.7	32.5	104	10.7	58.2	23
Alliance	25.1	21.1	33.8	21.0	55.2	27.4	41.2	26.6	50.4	20.7	32.2	103	10.3	57.7	22
NuHills	25.0	24.8	38.2	15.6	59.4	21.7	35.2	29.2	47.0	26.2	32.2	103	10.3	55.3	23
NuFrontier	23.5	20.3	38.1	18.4	61.5	26.9	31.1	22.2	55.6	22.2	32.0	103	10.5	57.4	24
Overley	16.9	25.9	34.1	25.6	53.7	29.9	35.6	15.7	48.6	32.8	31.9	102	10.3	56.2	24
Harry	30.0	20.1	28.4	15.7	51.8	25.7	43.7	25.3	53.5	20.0	31.4	101	9.8	54.4	22
Prowers 99	23.9	15.9	39.0	18.8	54.4	32.8	36.0	21.0	50.4	20.6	31.3	100	11.0	57.7	24
Infinity CL	26.2	23.2	32.0	17.8	57.1	27.4	37.3	26.8	45.8	17.8	31.1	100	10.3	56.6	22
Danby**	20.4	18.6	38.9	11.8	66.4	22.8	33.5	25.5	52.8	17.9	30.9	99	11.2	57.8	23
Yuma	18.9	19.6	35.4	19.3	56.0	28.8	28.8	23.2	54.1	24.2	30.8	99	10.2	56.5	20
Yumar	25.6	20.5	33.3	16.8	50.8	29.0	32.2	22.3	53.2	23.7	30.7	99	10.3	56.5	22
Endurance	17.2	22.9	29.4	23.0	61.4	25.4	30.4	28.6	48.2	20.4	30.7	98	11.1	58.0	24
Goodstreak	18.9	22.2	33.8	18.7	55.7	26.4	41.2	22.2	45.6	16.0	30.0	96	10.7	58.2	24
Ankor	22.0	21.1	38.4	9.8	55.8	27.3	33.3	24.5	51.1	14.4	29.7	95	10.5	57.1	21
TAM 111	23.0	17.0	28.3	7.1	62.4	27.4	32.4	23.4	56.7	16.6	29.4	94	11.4	57.5	25
Millennium	22.8	16.8	31.6	21.3	43.3	31.0	32.0	22.7	44.2	22.6	28.8	92	10.3	55.4	25
Thunderbolt	19.4	13.2	27.5	22.5	47.7	34.9	30.6	22.7	41.1	25.4	28.5	91	10.4	56.7	22
Akron	21.0	22.1	28.7	8.9	50.4	24.4	34.8	22.4	43.9	15.5	27.2	87	10.5	57.3	21
Wahoo	17.4	12.7	30.2	6.0	60.0	20.8	36.4	26.4	49.0	11.9	27.1	87	10.7	56.4	23
Stanton	22.3	22.5	23.7	10.5	53.8	23.0	25.9	22.2	41.9	18.6	26.4	85	9.8	58.2	22
Trego	20.0	17.3	31.7	7.8	50.2	20.4	31.7	30.1	39.3	13.1	26.2	84	10.9	58.2	22
NuHorizon	21.1	16.0	24.9	10.6	47.9	12.4	39.6	20.8	51.1	16.5	26.1	84	11.1	58.8	21
Lakin	12.2	22.3	16.5	3.8	44.1	20.3	37.5	19.2	41.7	9.6	22.7	73	10.7	58.1	22
Averages	**23.7**	**21.5**	**33.1**	**18.2**	**57.1**	**27.5**	**36.0**	**24.7**	**49.6**	**20.8**	**31.2**		**10.5**	**57.1**	**22.6**
$LSD_{(0.30)}$	2.7	2.8	3.9	2.0	5.8		5.3	3.1	3.2	2.6	1.2				

[1]Varieties in table ranked by the average yield over 10 locations in 2005.
[2]No moisture taken at Julesburg.
[3]No height notes at Burlington.
*CO00016 is being advanced toward variety release in fall 2006.
**"Danby" was tested by the experimental name KS02HW34.
***The LSD is computed from the Analysis of Variance of all entries in the trial, including the Colorado experimental lines (performance not shown).

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

	Averages						
Variety[1]	3-Yr	2-Yr	2005	2004	2003	3-Yr	2-Yr
	----------Yield (bu/ac)----------					Twt (lb/bu)	
CO00016*	46.3	43.3 [1]	38.9	52.1	53.6	57.4	56.9
Bond CL	45.9	42.1 [2]	39.0	48.4	55.2	56.7	56.0
Hatcher	44.5	39.9 [4]	35.8	48.3	56.0	58.2	57.4
Above	43.1	39.2 [5]	33.1	51.4	52.8	58.0	57.7
Avalanche	42.2	38.9	33.0	50.6	50.4	59.0	58.4
Jagalene	41.9	40.1 [3]	33.1	54.1	46.6	58.2	57.5
Prairie Red	41.5	38.1	33.1	48.0	50.2	57.8	57.4
AP502 CL	41.4	38.4	33.2	48.6	48.9	57.6	57.0
Yuma	41.3	36.7	30.8	48.4	53.0	57.3	56.5
TAM 111	41.0	36.4	29.4	50.2	52.6	58.4	57.5
Alliance	40.8	36.9	32.2	46.4	50.5	57.9	57.3
Yumar	40.6	36.7	30.7	48.7	50.3	57.6	56.8
Ankor	40.5	35.9	29.7	48.3	51.8	57.8	57.2
Jagger	40.0	37.6	32.7	47.3	46.0	57.3	56.5
Trego	38.9	33.3	26.2	47.7	52.9	59.3	58.6
Stanton	38.7	34.4	26.4	50.4	49.4	58.7	58.1
Akron	38.3	33.7	27.2	46.7	49.6	57.8	57.2
Prowers 99	37.9	34.9	31.3	42.2	45.4	58.6	57.8
Lakin	36.2	31.5	22.7	49.0	47.8	58.4	58.0
Thunderbolt	35.1	33.3	28.5	43.0	39.6	58.4	57.5
Harry	**	38.0	31.4	51.2	**	**	54.4
NuHills	**	37.5	32.2	48.1	**	**	55.6
NuFrontier	**	37.1	32.0	47.3	**	**	57.4
Goodstreak	**	37.0	30.0	51.0	**	**	58.2
Overley	**	36.3	31.9	45.1	**	**	56.5
Wahoo	**	34.4	27.1	49.1	**	**	56.4
Millennium	**	34.2	28.8	45.1	**	**	56.1
NuHorizon	**	32.0	26.1	43.7	**	**	58.5

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

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

*CO00016 is being advanced toward variety release in fall 2006.

**Harry, NuHills, NuFrontier, Goodstreak, Overley, Wahoo, Millennium, and NuHorizon have been tested in the UVPT only two years.

Colorado winter wheat Uniform Irrigated Variety Performance Trial summary for 2005.

	Location			2005 Averages				
Variety[1]	Fort Collins	Rocky Ford	Stratton	2005	% of Trial Average	Grain Moist	Test Wt	Plant Ht
	Yield (bu/ac)				%	%	lb/bu	in
Bond CL	94.8	92.0	82.7	89.8	115	10.2	59.6	36
Hatcher	80.3	97.2	91.6	89.7	115	10.7	60.7	34
GM10006	93.7	88.9	81.3	88.0	113	10.7	61.3	35
TAM 111	68.8	97.5	95.4	87.2	112	10.4	60.7	36
Jagalene	75.4	92.5	86.8	84.9	109	10.6	61.6	33
NuHills	66.8	99.1	87.1	84.3	108	10.3	60.7	31
Ankor	77.3	81.6	86.6	81.8	105	9.9	58.8	36
NuFrontier	75.9	99.1	62.0	79.0	101	10.5	60.6	35
Yuma	74.3	82.1	79.2	78.5	100	10.4	59.6	32
Antelope	70.2	83.9	81.4	78.5	100	10.3	59.7	33
Overley	62.2	80.2	87.9	76.8	98	10.0	60.6	35
Ok102	74.1	78.4	75.8	76.1	97	10.2	60.2	32
CO00016*	83.6	86.4	58.0	76.0	97	9.7	58.6	32
Dumas	62.2	87.3	70.5	73.4	94	10.4	59.6	32
Wesley	44.2	88.7	82.9	71.9	92	9.5	57.5	30
NuHorizon	54.0	84.6	76.2	71.6	92	10.6	60.5	30
Platte	65.5	77.7	62.8	68.7	88	10.5	60.5	29
W04-417	32.3	80.0	84.9	65.7	84	9.7	58.0	32
Prairie Red	46.9	81.0	65.3	64.4	82	9.6	57.3	32
Average	**68.6**	**87.3**	**78.9**	**78.2**		**10.2**	**59.8**	**32.8**
$LSD_{(0.30)}$	10.0	3.9	9.0	4.7				

[1]Varieties in table ranked by the average yield over three locations in 2005.
*CO00016 is being advanced toward variety release in fall 2006.
**The LSD is computed from the Analysis of Variance of all entries in the trial, including the Colorado experimental lines (performance not shown).

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

	Averages						
Variety[1]	3-Yr	2-Yr	2005	2004	2003	3-Yr	2-Yr
	----------Yield (bu/ac)----------					Twt (lb/bu)	
Jagalene	100.2	91.2	84.9	100.7	115.1	59.8	60.1
Yuma	98.3	93.0 [3]	78.5	114.6	107.1	58.5	58.5
Hatcher	97.0	94.5 [2]	89.7	101.6	101.4	59.2	59.6
Ankor	93.3	92.7 [4]	81.8	108.9	94.3	57.7	58.0
Antelope	92.6	87.3	78.5	100.6	101.5	58.4	58.2
Wesley	91.8	82.6	71.9	98.6	107.1	57.7	57.1
Prairie Red	91.7	81.7	64.4	107.6	108.5	56.9	56.8
Ok102	91.1	88.1	76.1	106.1	96.2	58.9	59.5
Dumas	90.4	84.4	73.4	101.0	100.3	58.8	59.0
Platte	85.9	78.2	68.7	92.5	98.8	58.2	59.1
Bond CL	**	99.0 [1]	89.8	112.9	**	**	58.3
NuHills	**	91.8 [5]	84.3	102.9	**	**	59.2
CO00016*	**	89.2	76.0	109.0	**	**	57.6
NuFrontier	**	88.2	79.0	101.9	**	**	59.1
Overley	**	87.1	76.8	102.7	**	**	59.4
NuHorizon	**	82.8	71.6	99.5	**	**	59.6

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

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

*CO00016 is being advanced toward variety release in fall 2006.

**Bond CL, NuHills, CO00016, NuFrontier, Overley, and HuHorizon have been tested in the IVPT only two years.

Trial Results (From Page 3)

combination of public and private varieties from Colorado and surrounding states. Each trial is planted in three replicates in a randomized complete block design. Yields are corrected to 13% moisture.

Variety Grain Protein Content- Dryland and Irrigated

Protein Contents of UVPT Entries at Three Trial Locations for 2005.

	Trial Locations				
Variety	Akron	Burlington	Julesburg	Walsh	Average
Jagger	18.1	18.4	18.7	13.4	17.2
Thunderbolt	18.2	18.1	16.5	15.0	16.9
Millennium	17.3	18.3	16.8	14.6	16.7
NuHills	17.5	17.8	17.0	14.6	16.7
TAM 111	17.2	18.2	17.9	13.5	16.7
Overley	18.1	18.0	17.6	13.0	16.7
NuHorizon	17.7	18.9	16.0	13.5	16.5
Wahoo	18.4	19.4	16.3	11.7	16.5
Westbred Keota	17.3	17.4	17.0	13.4	16.3
Goodstreak	17.8	17.7	17.5	11.7	16.2
Trego	16.9	17.8	16.8	12.5	16.0
Infinity CL	16.0	16.6	16.5	14.2	15.8
Avalanche	16.7	17.7	15.9	12.9	15.8
CO00739	16.7	18.1	16.1	12.3	15.8
Danby	16.6	17.7	16.4	12.4	15.8
CO01W173	16.8	17.9	15.7	12.5	15.7
Stanton	15.9	17.5	15.1	14.4	15.7
Lakin	17.6	19.1	15.3	10.8	15.7
Jagalene	17.3	17.1	16.3	11.9	15.7
Enhancer	17.2	17.0	17.0	11.4	15.7
Alliance	15.8	17.4	16.5	12.9	15.6
CO01W189-A1	17.6	17.4	16.7	10.6	15.6
CO01W191	17.0	16.7	16.1	12.5	15.6
CO01434-A1	17.0	18.5	16.1	10.4	15.5
CO01W171	16.9	18.0	16.4	10.8	15.5
Akron	15.9	18.0	15.7	12.4	15.5
CO01473	16.8	18.1	14.5	12.6	15.5
Harry	16.3	17.8	16.6	11.1	15.5
GM10006	17.6	17.4	15.8	10.9	15.4
NuFrontier	16.6	17.8	16.0	11.4	15.4
CO01W173-A3	16.5	17.7	16.0	11.5	15.4
CO00554	16.2	17.0	16.0	11.8	15.2
CO01434	16.1	18.2	15.7	10.9	15.2
AP502 CL	16.3	16.0	15.3	13.2	15.2
CO01W189	17.1	16.9	16.8	10.1	15.2
CO01W172	17.0	16.6	15.7	11.5	15.2
CO991057-A4	17.1	15.6	16.1	12.0	15.2
Yumar	16.8	17.4	15.1	11.2	15.1
Endurance	16.4	16.9	15.3	11.8	15.1
Yuma	15.4	16.8	15.8	12.3	15.1
CO01385	15.6	17.8	15.1	11.5	15.0
Ankor	15.7	17.8	15.8	10.6	15.0

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Variety	Akron	Burlington	Julesburg	Walsh	Average
Prowers 99	16.1	17.3	14.2	12.2	14.9
CO01212	15.8	17.4	14.7	11.7	14.9
CO00016	16.3	16.7	16.0	10.2	14.8
Above	14.7	16.3	15.7	12.3	14.7
CO01385-A1	16.0	17.2	14.7	10.2	14.5
CO00796	15.9	16.9	15.7	9.6	14.5
Hatcher	15.7	17.3	14.4	10.6	14.5
Prairie Red	14.9	16.8	13.9	11.7	14.3
Bond CL	14.2	16.0	16.1	10.4	14.2
CO991407-A3	15.4	15.7	15.3	10.3	14.2
Average	16.6	17.5	16.0	12.0	15.5

*Protein values are adjusted to a 12% moisture basis.

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Protein Contents of IVPT Entries at Fort Collins for 2005.

Variety	
Wesley	18.4
Overley	17.1
W04-417	16.7
Antelope	16.5
NuHills	16.3
Platte	15.9
NuHorizon	15.7
Ok102	14.6
Jagalene	14.6
NuFrontier	14.0
GM10006	14.0
Prairie Red	13.8
Hatcher	13.8
CO01W189-A1	13.6
Dumas	13.5
CO01W171	13.5
Yuma	13.4
CO01473	13.1
CO01W173-A3	12.9
CO01W189	12.8
CO01W172	12.8
CO00016	12.8
CO01434-A1	12.7
CO01W191	12.6
Ankor	12.4
CO01212	12.3
CO991407-A3	12.1
TAM 111	12.0
CO991057-A4	11.9
CO01385	11.9
CO01W173	11.6
CO01385-A1	11.4
Bond CL	11.4
CO01434	11.2
Average	13.6

*Protein values are adjusted to a 12% moisture basis.

Winter Wheat Variety Selection in Colorado for Fall 2005

Jerry Johnson and Scott Haley (August 2005)

Colorado's unpredictable climate and the occurrence of various insect, disease, and weed pests of wheat make it difficult to predict the future performance of wheat varieties based upon their performance in previous trials. Nevertheless, in the tables below we provide the information wheat producers need to make the best possible decision under our variable circumstances.

Issues specific to variety selection in 2005:

Stripe rust- The most common question thus far this year has been whether we will have stripe rust next year. No one knows of course because it has caused damage in three of the last five years and in 2005 appeared weeks earlier than we had seen it in previous years. On the other hand, stripe rust epidemics require a favorable environment, a susceptible variety, and presence of stripe rust spores - all three of which coincided in 2005. Many of the available varieties are susceptible to some degree, some more than others. The favorable environment last year was promoted by early planting, good moisture and good late-fall growing conditions followed by a mild winter, prolific tillering and rapid early spring growth. These environmental conditions are rare in Colorado and might not occur in 2006. The presence of spores is becoming more common in Colorado but clearly irrigated wheat production is at much greater risk than dryland wheat.

White wheat- CSU personnel and the Colorado wheat industry are convinced that white wheat is most promising future for wheat production and marketing in Colorado. The white wheat varieties, Avalanche and Trego, have performed well in the past few years but Trego must have been more affected by the heat and drought stress in May than Avalanche and some of the other varieties. We remain convinced that a white wheat variety should be high on the list for variety selection in 2005.

Russian wheat aphid- New forms (called "biotypes") of RWA have evolved and rendered ineffective the resistance found in all available RWA-resistant varieties. However, some of these varieties perform very well and should be considered for their yielding capability compared to other susceptible varieties. Hatcher, Bond CL, and Ankor are examples of RWA-resistant varieties that are high performance varieties for Colorado.

CLEARFIELD* wheat- The variety Above is still a top performing variety but the new variety from CSU, Bond CL, has performed even better under dryland conditions over the past three years. It is important to remember that you can't save seed of these varieties - even to plant on your own farm. The Plant Variety Protection Act and a U.S. Utility Patent protect them.

Selecting your variety

Dryland wheat producers: **Our first suggestion is to plant more than one variety in order to spread your risk**. The yield table below is based on 3-Yr average performance in our trials, a method for variety comparison shown to be more reliable than single location or single year performance. Note that varieties are alphabetically ranked within a column, rather than ranked by average yields, to stress that differences among the varieties are not statistically significant. Bond CL and Hatcher are the two newcomers to the highest potential performance column and are the newest CSU releases. These two varieties will be included in the new 2005/06 Collaborative On-Farm Test program. Relative maturity, measured by heading date, might be one way to spread risk related to drought, hail, or freeze damage. Susceptibility to stripe rust might also be a criterion for variety selection in 2005 although be careful not to base variety selection on stripe rust resistance alone. Under our normal low rainfall conditions, wheat streak mosaic virus might be a more consistent threat than stripe rust and worthy of consideration when selecting a variety. Plant height and coleoptile length might be important criteria for southeastern Colorado producers.

Irrigated wheat producers: Most irrigated producers plant a single variety and the most important criteria are yield and straw strength from the tables below. The Platte program has returned profit to many irrigated wheat producers through the incentive package, although some yield loss might be expected when stripe rust is a problem and is not effectively controlled with fungicides. The irrigated trials in Colorado have been very good the past three years and Jagalene, Yuma, Hatcher, and Ankor have performed very well even though Yuma and Jagalene are the only ones with above average straw strength. The newly released varieties Hatcher and Bond CL are welcome additions to our high yielding irrigated wheat varieties.

High Performance Varieties for Dryland Eastern Colorado		
Higher Yielding	Intermediate	Lower Yielding
Above Avalanche Bond CL Hatcher Jagalene	Alliance Ankor AP502 CL Jagger Prairie Red TAM 111 Trego Yuma Yumar	Akron Lakin Prowers 99 Stanton Thunderbolt
High Performance Varieties for Colorado Irrigated Conditions		
Higher Yielding	Intermediate	Excellent 2-Yr Performance
Ankor Hatcher Jagalene Yuma	Antelope Dumas Ok102 Platte Prairie Red Wesley	Bond CL NuHills
Stripe Rust		
Moderately Resistant-Resistant	Intermediate	Moderately Susceptible-Susceptible
Antelope Hatcher Jagalene Jagger TAM 111 Wesley	Alliance Dumas Prowers 99 Stanton Yuma Yumar	Above Akron Ankor AP502 CL Avalanche Bond CL Lakin Platte Prairie Red Thunderbolt Trego
Wheat Streak Mosaic Virus		
Moderately Resistant-Resistant	Intermediate	Moderately Susceptible-Susceptible
	Above AP502 CL Avalanche Jagalene Jagger Lakin Prairie Red Stanton TAM 111 Thunderbolt Trego Yuma Yumar	Akron Alliance Ankor Antelope Bond CL Dumas Hatcher Platte Prowers 99 Wesley
Test Weight		
Highest	Average	Lowest
Avalanche Dumas Jagalene Platte Prowers 99 Stanton TAM 111 Thunderbolt Trego	Above Akron Alliance Ankor Antelope Hatcher Jagger Lakin Wesley Yuma Yumar	AP502 CL Bond CL Prairie Red
Heading Date		
Earliest	Medium	Latest
Above AP502 CL Jagger Prairie Red	Akron Alliance Ankor Antelope Avalanche Bond CL Dumas Hatcher Jagalene Lakin Platte Stanton TAM 111 Trego Wesley Yuma Yumar	Prowers 99 Thunderbolt

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Height		
Shortest	Medium	Tallest
Above AP502 CL Hatcher Platte Prairie Red Wesley Yuma	Akron Alliance Ankor Antelope Avalanche Bond CL Dumas Jagalene Jagger Lakin Stanton TAM 111 Thunderbolt Trego Yumar	Prowers 99
Coleoptile Length		
Shortest	Medium	Longest
Antelope Dumas Platte Yuma Yumar	Alliance Avalanche Bond CL Hatcher Jagalene Lakin Trego Wesley	Above Akron Ankor AP502 CL Jagger Prairie Red Prowers 99 Stanton TAM 111 Thunderbolt
Winter Hardiness		
Good	Average	Fair
Akron Alliance Ankor Antelope AP502 CL Jagalene Prowers 99 Wesley	Above Avalanche Bond CL Dumas Hatcher Lakin Platte Prairie Red Stanton TAM 111 Thunderbolt Trego Yuma Yumar	Jagger
Protein Content		
Highest	Average	Lowest
Akron Ankor Antelope Jagger Lakin Prairie Red Prowers 99 Thunderbolt Trego Wesley	Above Avalanche Hatcher Jagalene Platte Stanton Yumar	Alliance AP502 CL Bond CL Dumas TAM 111 Yuma
Straw Strength (Irrigated Only)		
Best	Intermediate	Poorest
Antelope Bond CL Dumas Jagalene NuHills NuHorizon Ok 102 Overley Platte Wesley Yuma	Ankor Hatcher NuFrontier Prairie Red	

GREEN AND GROWING

D. Bruce Bosley, Extension Agent/Cropping Systems
Colorado State University Cooperative Extension, 4 Aug 2005

Nearly all the 2004/2005 northeast Colorado winter wheat crop was impacted by wheat diseases. Drought and heat stress also factored into the yield reduction experienced by many irrigated and most dryland fields. Dryland producers have few remedies for reducing drought risk; however, there are steps that wheat producers can do to reduce disease risks for the 2005/2006 crop. Some of these remedies can be initiated now in the late summer.

Planting resistant varieties can be an effective, economical, and environmentally friendly method of disease control. Planting several different varieties with different strengths and weaknesses is a good disease management and risk management strategy. It reduces the risk that any particular disease or weather event, such as freeze or heat stress will cause catastrophic losses. Consider stripe rust resistance in selecting varieties for irrigated and high yield wheat situations- Hatcher and Jagalene are both high yielding and moderately resistant/resistant to stripe rust if rust races don't change in the next year and become virulent to these varieties.

Control volunteer wheat to eliminate the "green bridge" that allows pests to survive the period between wheat crops. Volunteer wheat serves as a reservoir for wheat streak mosaic, High plains mosaic, barley yellow dwarf, and leaf rust. It also harbors Russian wheat aphids and other wheat insect and arthropod pests. The objective is to break the green bridge before the new crop emerges. Therefore, volunteer should be eradicated at least 2 weeks before planting to ensure a thorough kill. Field border treatments reduce the spread of insects such as grasshoppers, aphids and greenbugs, and depending on the insecticide reduce wheat curl mites.

Early planting is also a risk factor for several diseases including wheat streak mosaic, High plains mosaic, and barley yellow dwarf. Avoid planting wheat in Northeast Colorado before September 10, and hopefully adjacent crops and grass areas will not remain green past the end of September.

Please contact me, Bruce Bosley on these or other topics at (970)522-3200 extension 285.

PLANTING TIPS FOR THIS FALL'S WHEAT CROP

Ron Meyer -Golden Plains Area Extension Agent (Agronomy)

The first step to planting the crop is observation of the current crop. Observing different fields, attending wheat field days and reading about varieties provide information about newer wheats and choosing varieties that fit your farming operation.

As you plan ahead there are several things you can use as a guide that can affect your wheat yields; planting date, seeding rate and seed size.

***** *Planting date.* Wheat has a wide window for optimum planting dates across Colorado. In Eastern Colorado, good results have been obtained by planting around September 10. Many producers favor early planting to ensure good stand establishment, reduce the risk of winterkill, and to hold the soil down and decrease the chance of wind erosion. However, early planting increases the risk and seriousness of wheat streak mosaic virus, barley yellow dwarf, Hessian fly infestations and early planting can provide a green bridge for Russian wheat aphid populations to multiply in the fall and overwinter in newly established wheat. Early planted wheat is also more likely to have excessive fall growth that utilizes valuable soil moisture which could reduce yields the next spring. We now know that planting can be delayed until the end of September or early October and the seedlings have a good chance of having at least three leaves before winter. Waiting to plant until after the fly free date is a good way to reduce problems associated with early planting. Later planting dates mean that the seeding rate should be increased to compensate for the reduced tillering potential.

***** *Seeding rate.* Seeding rates vary across the state. For dryland wheat production in Eastern Colorado, seeding rates of 30 to 60 pounds per acre is common (400,000 to 800,000 seeds per acre), with most producers planting 45 to 60 pounds per acre. The number of seeds per pound of wheat seed can vary significantly from one seed lot of the same variety to another. Consequently, seeding by seeds per acre is recommended and seeding rates of 500,000 to 700,000 seeds per acre would be desirable under most conditions. Some varieties respond to higher seeding rates while some varieties yield the same at high and medium seeding rates. As planting dates are delayed, seeding rates should be increased.

***** *Seed size.* Large seed has been noted to increase wheat grain yields in Kansas. Large seed is recognized to increase vigor, tillering and fall forage production compared to small seed. However, increased grain yields cannot be guaranteed every year or with every variety with planting large seed. Varieties that tiller well can compensate for small seed size. In mild fall weather, the effect of planting large seed may be reduced because seedlings from small seed have more time to tiller and become established. Also, when planting by volume (as most do), more seeds per acre will be planted when using small seed unless planting equipment is adjusted. Although planting large seed does not necessarily result in higher grain yields every year, planting large seed may show a yield advantage under adverse growing conditions.

Benefits of Plant Variety Protection to Farmers

Brad Erker, Director of Colorado Seed Programs

The Plant Variety Protection Act (PVPA) was signed into law in 1970, and amended in 1994. The PVPA's objective is to encourage development of novel varieties of plants and make them available to the public, providing protection to those who develop or discover them. The benefits of PVP to the developers of new varieties are quite obvious. But what are the benefits to farmers?

Crop diseases, insect pests, weed problems, and market conditions are constantly changing, and new varieties are an essential and vital tool for farmers to remain competitive both at home and on an international scale. Since most newly released plant varieties are protected under PVP and Title V of the Federal Seed Act, they can only be sold as a class of certified seed. A portion of the certified seed cost, sometimes termed a royalty, goes back into research and allows scientists to reinvest in future variety development programs and agronomic research. This completion of the plant breeding cycle, and long-term view of agricultural progress, is truly a benefit of Plant Variety Protection to farmers. In addition, the purchase of certified seed is the best way to be sure of planting quality seed.

What does Plant Variety Protection mean? Basically, the seed of these varieties must only be SOLD as a class of certified seed. A farmer can save back "bin-run" seed if he so desires for planting on his own holdings, but cannot sell any extra seed production (with the exception of CLEARFIELD herbicide tolerant wheat). A Certificate of Protection usually lasts 20 years from

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when the variety was released. This helps to ensure that strong new plant varieties will continue to be available and help keep our local agricultural economy strong.

To check on the PVP status of a particular variety, visit the PVP website at http://www.ams.usda.gov/science/pvpo/PVPindex.htm or contact the Colorado Seed Growers Association at (970) 491-6202.

Wheat Information on the Web

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

Agripro Wheat
http://www.agriprowheat.com/

American Institute of Baking
http://www.aibonline.org/

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

Clearfield* Wheat Stewardship Guide
http://wheat.colostate.edu/steward.pdf

Clearfield* Wheat Technical Bulletin
http://wheat.colostate.edu/techbull.pdf

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

Grain Genes
http://wheat.pw.usda.gov/GG2/index.shtml

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/

Kansas State University-Hays Wheat Breeding
http://www.wkarc.org/Research/ARCH/wheat/wheat.asp

MASWheat - "Bringing Genomics to the Wheat Fields" Project
http://maswheat.ucdavis.edu/

National Association of Wheat Growers
http://www.wheatworld.org/

National Jointed Goatgrass Initiative
http://www.jointedgoatgrass.org/

Nebraska Wheat Quality Lab
http://agronomy.unl.edu/wheatlab/index.htm

Oklahoma State University Wheat Breeding
http://www.wit.okstate.edu

South Dakota State University Wheat Breeding
http://plantsci.sdstate.edu/triticum

University of Nebraska Wheat Breeding
http://agronomy.unl.edu/grain/index.htm

USDA-ARS Hard Winter Wheat Quality Lab (Manhattan, KS)
http://129.130.148.103/gqu/HWWQL/HWWQLHome.htm

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

Wheat Export Trade Education Committee
http://www.wetec.org/

US Wheat Associates
http://www.uswheat.org/

Wheat Foods Council
http://www.wheatfoods.org/

Wheat Grain Quality and Clearfield* Wheat
http://wheat.colostate.edu/techbull2.pdf

Wheat Quality Council
http://www.wheatqualitycouncil.org/