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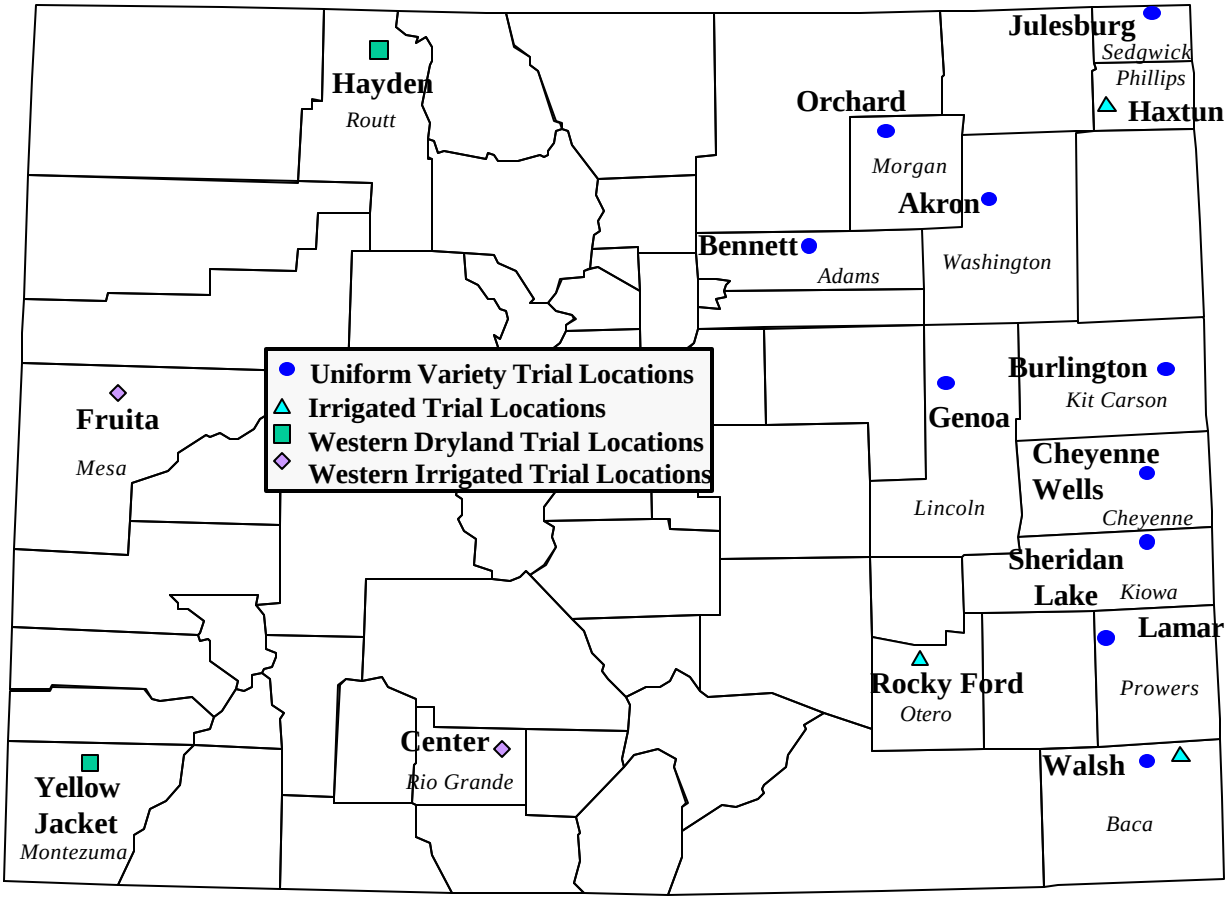
2000 Wheat
Variety Performance Trials



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Technical Report TR 01-4

Agricultural Experiment Station	Department of Soil and Crop Sciences	Cooperative Extension	May 2001

TABLE OF CONTENTS

2000 COLORADO WINTER WHEAT VARIETY PERFORMANCE TRIALS

Introduction

Making Better Decisions is a publication of Colorado State University. We are committed to providing the best information, in an appealing form, and in the most timely manner to Colorado wheat producers. Reliable and unbiased performance trial results can lead to better variety selection and earlier adoption of higher yielding varieties.

Colorado State University conducts variety performance trials to obtain unbiased and reliable information for Colorado wheat producers to make better variety decisions. Good variety decisions can save Colorado wheat producers millions of dollars each year.

Immediately after harvest, and prior to fall planting, CSU's Crops Testing program publishes current trial results in different media forms:

1) Results are published in CWAC's *Wheat Farmer*
2) Variety trial results are put up on DTN (Data Transmission Network)
3) Variety trial results are available on the Crops Testing Internet page: *www.colostate.edu/Depts/SoilCrop/extension/CropVar/wheat1.html*
4) Results are published in *From the Ground Up*, a Soil and Crop Science Extension publication
5) Results are published in *The Colorado Farmer Stockman*
6) E-mail copies of results are sent to Cooperative Extension agents and producers who request them

Trial Conditions and Methods - 1999/00

Adequate soil moisture conditions in the fall and mild winter temperatures led to good plant stands. Mild but dry winter conditions prevailed throughout much of the state. Favorable winter conditions led to large insect populations and losses were suffered from viral diseases transmitted by insects. Russian wheat aphid, bird cherry-oat aphid, and greenbug infestations were severe in SE Colorado; greenbug and wheat curl mites were severe along the I-70 corridor; and Adams County had severe infestations of brown wheat mites. Barley yellow dwarf virus, transmitted by the bird cherry-oat aphid and greenbugs, was widespread from Baca to Kit Carson counties. Wheat streak mosaic virus and/or high plains disease was present in counties along the Kansas border. Very little leaf rust infection was observed in eastern Colorado although stripe rust (also known as yellow rust) infection was severe at the Genoa location and influenced yields. Following good rains in April, drought conditions dominated most of eastern Colorado in late spring through grain filling. Several late spring freeze events occurred but the worst, on May 13, reduced yields on large parts of eastern Colorado as well as compromising two of our variety trials.

Our dryland winter wheat variety trial was restructured in 1999 so that the Low Moisture (LMVT) and Higher Moisture Variety Trials (HMVT) of previous years were combined into a single Uniform Variety Performance Trial (UVPT) conducted at ten locations. There were 60 entries in the dryland trial, with approximately half named varieties and half experimental lines. Six hybrids were entered by HybriTech-Monsanto, and Cargill-Goertzen entered five varieties. Two experimental lines from Kansas State University, and one new Nebraska variety were entered alongside common check varieties and experimental lines from the CSU breeding program. The CSU entries included two new white wheat lines, six herbicide-tolerant wheat lines, and experimental lines in their first, second, and third year of testing. Two irrigated variety trials were conducted at Rocky Ford and Haxtun. A randomized complete block field design with three replicates is used in all trials. Four or six, 12 inch-spaced rows, 46 feet long, are harvested from each plot. All dryland trials are seeded at 600,000 seeds/acre and the irrigated trials are planted at 900,000 seeds/acre.

The trial at Orchard was lost due to drought, disease, and freeze damage. The results of the Bennett trial were compromised by the freeze and non-experimental errors led us to discard the results from the Sheridan Lake trial. This year's yields were lower than in the recent past - closer to long-term average yields - and several varieties that ranked

high in the trial in the past (and risen to prominence in state acreage) did not rank as high this year. There were only modest total differences in average yield from the top-ranking variety to the lowest-ranking variety due to the multitude of different stresses experienced this year. Consequently, variety rank in 2000 is less reliable than average performance over multiple years as an indicator of expected future performance. Alliance and Trego were high yielding in both the high yielding environments of last year and the low yielding environments this year. The herbicide tolerant wheat lines (in TAM 110 background) were slightly higher yielding than TAM 107 and Prairie Red.

This year's trials, under strong drought, heat, insect, and disease pressure were very valuable to the CSU wheat-breeding program to screen tough, new varieties for the future. The unified trial included 32 experimental lines (not included in Table 2), eight of which ranked among the top ten entries for highest average yield over locations, with the best yielding 114% of TAM 107. The irrigated trial results illustrate how some public varieties are able to compete favorably with hybrids at high yield levels.

Variety planting suggestions, based on these trial results, are found in the revised "Decision Tree for Winter Wheat Variety Selection in Colorado". We encourage producers to spread the variety decision risk by planting more than one variety. The average performance over two or three years is a proven tool for yield performance evaluation but producers should be mindful of other varietal characteristics, like maturity, height, disease and insect resistance, quality parameters, and winterhardiness, that influence variety adaptation and performance, and marketing options.

Table 1. 2000 Trial Information.

Locations	Date of Planting 1999	Date of Harvest 2000	Soil Texture	Fertilization (lb/A) Nitrogen N	Fertilization (lb/A) Phosphorus P_2O_5	Type of Irrigation
Uniform						
Akron	9/22/99	7/10/00	Silty clay	70	0	None
Bennett	9/15/99	7/05/00	Sandy clay	50	18	None
Burlington	9/13/99	7/05/00	Silty clay	85	25	None
Cheyenne Wells	9/18/99	7/01/00	Silt loam	30	18	None
Genoa	9/14/99	7/11/00	Sandy clay	55	18	None
Julesburg	9/15/99	6/28/00	Clay	45	0	None
Lamar	9/17/99	7/02/00	Silt loam	45	18	None
Sheridan Lake	9/18/99	7/02/00	Silt loam	5	18	None
Walsh	9/24/99	6/26/00	Sandy clay loam	45	0	None
Irrigated						
Haxtun	9/22/99	7/13/00	Sand loamy	223	60	Sprinkler
Rocky Ford	9/29/99	6/26/00	Silty clay loam	60	50	Furrow

This report is made available at no charge compliments of the Colorado Wheat Administrative Committee.

Description of winter wheat varieties.

NAME AND PEDIGREE	ORIGIN	RWA	HD	HT	SS	COL	WH	LR	WSMV	TW	PC	MILL	BAKE	COMMENTS
2137 W2440/W9488A//2163	KSU-1995	S	5	5	2	3	3	7	4	4	6	4	4	Public release from Pioneer winter wheat donation to Kansas State University. Semidwarf, medium-early maturity. Good winterhardiness, good straw strength. Good barley yellow dwarf virus tolerance, very susceptible to stem rust. Good performance record in both dryland and irrigated CSU Variety Trials.
Akron TAM 107/Hail	CSU-1994	S	5	5	4	4	3	8	9	4	6	6	5	Semidwarf, medium-early maturity, vigorous fall and spring growth characteristics, closes canopy early in spring. Lax spike may contribute to enhanced hail tolerance. Excellent yield performance record in Colorado.
Alliance Arkan/Colt//Chisholm sib	NEB-1993	S	3	5	5	4	2	8	9	6	7	6	6	Medium-early maturing semidwarrf, short coleoptile, above average tolerance to root rot and crown rot. Excellent yield performance record in Colorado.
Cossack BCD1828/83	Goertzen-1998	S	7	7	5	6	NA	7	9	3	3	1	1	A private entry from Cargill-Goertzen. Medium-tall, medium-late maturity with marginal straw strength. Very good fall growth characteristics and milling and baking quality characteristics.
Custer F-29-76/TAM-105//Chisholm	OK-1994	S	4	5	3	1	5	6	9	4	5	4	7	Medium-maturity, short, with very good straw strength. Good performance record under irrigated conditions in Colorado. Very marginal baking quality characteristics.
Enhancer 1992 Nebraska Bulk Selection	Goertzen-1998	S	5	5	8	3	NA	7	6	7	5	6	6	A private entry from Cargill-Goertzen. Medium height and medium maturity. Poor straw strength (just slightly better than Scout 66) and very low test weight patterns. Very good fall growth characteristics.
Golden Spike Arbon/Hansel/4/Hansel/3/CI14106/Columbia/2/McCall	Utah St.-1999	S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Hard white winter wheat (HWW) developed by Utah State University. Bronze-chaffed, very good noodle quality characteristics, resistant to dwarf bunt and common bunt. Marketed by General Mills, first entered in Colorado Trials in 2001.
Halt Sumner/CO820026,F1//PI372129, F1/3/TAM 107	CSU-1994	R	2	1	3	4	3	9	7	6	2	4	1	Developed from a complex cross with 50% TAM 107 parentage. RWA resistant, semidwarf, early maturity, very good milling and baking quality characteristics.
Intrada Rio Blanco/TAM 200	OK-2000	S	4	3	NA	NA	NA	5	7	2	4	1	1	Hard white winter wheat (HWW) developed by Oklahoma State. Medium maturity, semidwarf, very good millling and baking quality. First entered in Colorado Trials in 2001.
Jagger KS82W418/Stephens	KSU-1994	S	1	4	6	4	8	8	4	6	2	6	1	Developed from cross between a Karl sister selection and a soft white wheat from Oregon. Bronze-chaffed, early maturing semidwarf, good tolerance to WSMV. Breaks dormancy very early, marginal winterhardiness. Very good baking quality characteristics.
Kalvesta Oelson/Hamra//Australia 215/3/Karl92	Goertzen-1999	S	4	2	3	4	NA	9	8	3	2	3	3	A private entry from Cargill-Goertzen, developed from a cross with 50% Karl 92 parentage. Medium-early, semidwarf. Good milling and baking quality characteristics.
Lakin Arlin/KS89H130	KS-Hays-2000	S	5	5	4	3	NA	9	5	4	6	4	3	Hard white winter wheat (HWW) developed by KSU program in western Kansas (Hays). Medium height, medium maturity. Suitable for both domestic (bread) and export (Asian noodles) uses. First entered in Colorado Trials in 2000.
Nuplains Abilene/KS831862	NEB-1999	S	8	1	2	3	NA	6	8	1	5	1	2	Hard white winter wheat (HWW). Medium-late maturity, semidwarf, excellent straw strength, very high test weight. Very good milling and baking quality characteristics. First entered in Colorado Trials in 2000.

*Russian Wheat Aphid resistance (RWA), heading date (HD), plant height (HT), straw strength (SS), Coleoptile length (COL), winterhardiness (WH), leaf rust resistance (LR), wheat streak virus tolerance (WSMV), test weight (TW), Protein Content (PC), milling quality (MILL), and baking quality (BAKE).

* Rating scale: 0 - very good, very early, or very short to 9 - very poor, very late, or very tall.

NAME AND PEDIGREE	ORIGIN	RWA	HD	HT	SS	COL	WH	LR	WSMV	TW	PC	MILL	BAKE	COMMENTS
Prairie Red CO850034/PI372129//5* TAM 107	CSU-1998	R	1	2	4	5	3	9	5	4	4	4	6	Developed via "backcross transfer" of RWA resistance directly into TAM 107. Bronze-chaffed, semidwarf, early maturity. Very similar to TAM 107 except for its RWA resistance. Poor end-use quality reputation.
Prowers CO850060/PI372129//5* Lamar	CSU-1997	MR	7	7	7	8	2	6	7	2	2	4	2	Developed from the backcross transfer of RWA resistance into Lamar. Moderately resistant to RWA, tall, medium-late maturity, very good milling and baking quality characteristics. Similar to Lamar, except moderately resistant to RWA.
Prowers 99 CO850060/PI372129//5* Lamar	CSU-1999	R	7	7	7	8	2	6	7	2	2	4	2	Developed from reselection within Prowers for improved RWA resistance. Tall, long coleoptile, medium-late maturity, high test weight and very good milling and baking quality characteristics. Very similar to Lamar and Prowers, except for improved RWA resistance.
Stanton PI220350/KS87H57//TAM-200/KS87H66/3/KS87H325	KS-2000	R	5	5	5	2	NA	2	5	3	6	1	4	RWA-resistant (different gene from CSU varieties), medium height and medium maturity. Good test weight. First entered in Colorado Variety Trials in 2000.
TAM 107 TAM 105*4/Amigo	TX-1984	S	1	2	4	5	3	9	5	4	5	4	7	Developed via "backcross transfer" of Greenbug resistance directly into TAM 105. Bronze-chaffed, early maturing semidwarf, medium long coleoptile, good heat and drought tolerance, poor end-use quality reputation. Very susceptible to leaf rust.
TAM 110 (TX71A562-6*4/Amigo)*4/ Largo	TX-1995	S	1	4	4	3	3	9	5	4	6	5	7	Developed via "backcross transfer" of an additional Greenbug resistance gene directly into TAM 107. Very similar to TAM 107. Marginal end-use quality. Good yield performance record in Colorado.
Trego KS87H325/Rio Blanco	KSU-1999	S	6	4	3	3	4	2	5	2	7	3	3	Hard white winter wheat (HWW) developed by KSU program in western Kansas (Hays). Medium maturity, semidwarf with good straw strength, high test weight, and good end-use quality characteristics. Good dryland performance record in Colorado Variety Trials.
Venango Random Mating Population	Cargill-Goertzen-2000	S	6	4	3	3	NA	5	5	3	5	NA	NA	A private entry from Cargill-Goertzen. Medium-late semidwarf, very good straw strength, good test weights. Very good yield performance under irrigated conditions in CSU Variety Trials. Observed to shatter quite severely in 1999 (Lamar, CO dryland testing site).
Wesley KS831936-3//Colt/Cody	NEB-1998	S	4	0	2	4	3	7	7	8	3	4	2	Medium-early, short, excellent straw strength. Good winterhardiness and baking quality characteristics. May be best adapted for high-input irrigated production systems.
Wichita Early Blackhull/Tenmarq	KSU-1944	S	4	9	8	8	5	NA	NA	3	NA	4	7	Tall, early, very long coleoptile, very poor straw strength, strong tendency to shatter prior to harvest. (Long-term check variety)
Yuma NS14/NS25/2/2*Vona	CSU-1991	S	5	4	3	3	5	8	6	5	5	5	2	Developed from a complex cross with 75% Vona parentage. Medium maturity, semidwarf, very good straw strength, short coleoptile, good baking quality characteristics.
Yumar Yuma/PI372129//CO850034 /3/4*Yuma	CSU-1997	R	5	4	3	3	5	8	6	4	7	5	2	Developed via "backcross transfer" of RWA resistance directly into Yuma. Medium-maturing semidwarf. Very good straw strength, slighly better than Yuma despite taller stature. Good baking quality characteristics.

*Russian Wheat Aphid resistance (RWA), heading date (HD), plant height (HT), straw strength (SS), Coleoptile length (COL), winterhardiness (WH), leaf rust resistance (LR), wheat streak virus tolerance (WSMV), test weight (TW), Protein Content (PC), milling quality (MILL), and baking quality (BAKE).

* Rating scale: 0 - very good, very early, or very short to 9 - very poor, very late, or very tall.

Table 2. Colorado winter wheat Uniform Variety Performance Trial summary for 2000.

	Location								Averages			
			Cheyenne						2000		2-Yr	3-Yr
Variety[1]	Akron	Bennett	Burlington	Wells	Genoa	Julesburg	Lamar	Walsh	Yield	Twt	1999/00	1998/99/00
	----------Yield (bu/ac)----------								bu/ac	lb/bu	--------bu/ac--------	
Trego	45.6	36.2	36.0	46.3	62.9	30.3	33.2	39.6	42.0	59.2	56.0	-----
XH9806	36.0	35.9	41.1	47.9	62.0	34.6	32.8	39.0	41.9	56.6	-----	-----
QAP 7406	44.5	45.8	41.7	46.0	66.1	32.7	26.1	32.0	41.3	57.1	-----	-----
2137	43.0	34.5	38.0	46.0	61.4	31.6	26.7	41.0	41.1	55.3	54.8	54.3 [4]
Q 7588	36.9	45.1	43.0	49.2	60.5	34.2	27.0	36.8	41.1	55.8	-----	-----
Lakin	36.0	31.9	39.9	48.3	60.1	35.5	26.2	38.6	40.6	56.4	-----	-----
Alliance	41.2	38.8	39.6	45.5	57.5	36.3	27.9	35.0	40.4	55.7	56.5	56.6 [1]
XH7463	39.1	42.4	33.5	45.7	63.4	32.6	28.6	40.0	40.4	56.1	-----	-----
Yuma	38.1	30.1	36.4	42.6	63.3	34.7	26.8	40.2	40.3	56.1	54.5	54.4 [3]
TAM 110	37.7	34.9	47.3	44.8	58.6	36.3	22.3	35.1	40.3	56.0	53.2	53.6
Venango	34.4	35.0	43.5	42.0	63.1	31.8	26.9	40.1	40.3	57.5	51.9	-----
Nuplains	39.1	35.2	42.1	46.8	56.9	30.9	28.3	36.6	40.1	59.1	-----	-----
Prairie Red	43.0	32.8	38.9	45.3	52.9	33.2	24.9	39.9	39.9	56.2	54.0	53.0
TAM 107	39.0	24.0	38.6	42.7	58.2	37.9	22.4	39.1	39.7	56.4	52.4	53.6
Stanton	34.5	36.1	36.5	48.4	61.8	28.6	28.4	34.6	39.0	57.5	-----	-----
Kalvesta	34.2	27.0	35.4	47.2	55.5	33.6	30.7	36.5	39.0	58.1	53.1	-----
Enhancer	37.8	40.4	39.3	43.8	61.8	29.8	24.0	36.4	39.0	53.9	54.0	54.0 [5]
QAP 7510	37.0	26.6	36.8	45.7	58.8	30.7	27.7	35.8	38.9	56.7	-----	-----
Cossack	33.1	30.4	41.8	45.7	57.9	32.5	25.0	36.0	38.9	57.4	-----	-----
G15048	36.2	45.2	34.7	44.1	62.1	32.8	28.0	33.0	38.7	58.0	-----	-----
Akron	38.8	47.0	29.8	43.9	67.8	28.3	24.8	34.4	38.3	56.2	54.0	54.9 [2]
XH3207	28.1	30.2	40.7	42.7	60.9	30.8	27.4	34.9	37.9	57.4	-----	-----
Jagger	41.6	26.6	34.1	40.6	55.2	39.4	24.1	28.6	37.6	55.2	-----	-----
Halt	38.3	29.6	30.8	40.1	58.3	31.7	21.9	32.7	36.3	55.3	50.8	51.6
Yumar	35.1	36.2	32.9	40.8	56.2	31.2	24.6	32.1	36.1	56.5	52.9	52.0
Prowers 99	29.1	47.4	22.3	36.5	53.7	21.8	23.9	28.9	30.9	57.3	-----	-----
Prowers	32.4	44.8	22.8	37.4	54.8	20.9	21.7	25.7	30.8	57.5	47.0	48.1
Wichita	26.1	26.5	26.3	36.4	41.7	27.5	19.9	26.6	29.2	57.8	38.6	38.9
Average	**37.0**	**35.6**	**36.6**	**44.0**	**59.0**	**31.9**	**26.2**	**35.3**	**38.6**	**56.7**		
CV%	10.7	12.6	12.8	8.1	9.2	8.6	11.0	10.2				
$LSD_{(0.30)}$	3.3	3.7	4.1	3.0	4.5	2.4	2.4	3.1				

[1]Varieties in table ranked by the average yield over seven locations in 2000 (Bennett not included).

[1.....5] Variety rank based on 3-Yr average yields.

Colorado and Kansas experimental lines not included.

Table 3. Colorado winter wheat Uniform Variety Performance Trial summary for 1998-00.

	Averages							
	1998		1999		2000		3-Yr	
Variety*	Yield	Test Weight	Yield	Test Weight	Yield	Test Weight	Yield	Test Weight
	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu
Alliance	56.8	57.7	67.7	57.3	40.4	55.7	56.6	57.0
Akron	56.2	58.0	65.1	57.6	38.3	56.2	54.9	57.4
Yuma	54.4	57.5	64.4	57.0	40.3	56.1	54.4	56.9
2137	52.6	57.5	64.4	57.6	41.1	55.3	54.3	57.0
Enhancer	54.0	57.1	64.6	56.7	39.0	54.0	54.0	56.1
TAM 107	55.6	57.2	61.4	57.2	39.7	56.4	53.6	57.0
TAM 110	54.3	57.3	62.2	56.9	40.3	56.0	53.6	56.8
Prairie Red	51.3	57.2	64.0	57.2	39.7	56.2	53.0	57.0
Yumar	50.4	58.3	64.6	57.7	36.1	56.5	52.0	57.6
Halt	53.0	57.4	61.1	56.8	36.3	55.3	51.6	56.6
Prowers	50.1	59.0	58.3	59.1	30.8	57.5	48.1	58.7
Wichita	39.3	57.3	45.2	58.9	29.2	57.9	38.9	58.0

*Varieties in table rank based on 3-Yr average yields.

Table 4. Colorado winter wheat Uniform Variety Performance Trial summary for 1999-00.

	Averages					
	1999		2000		2-Yr	
Variety*	Yield	Test Weight	Yield	Test Weight	Yield	Test Weight
	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu
Alliance	67.7	57.3	40.4	55.7	56.5	56.7
Trego	65.8	58.9	42.0	59.2	56.0	59.0
2137	64.4	57.6	41.1	55.3	54.8	56.6
Yuma	64.4	57.0	40.3	56.1	54.5	56.6
Prairie Red	64.0	57.2	39.7	56.2	54.0	56.8
Akron	65.1	57.6	38.3	56.2	54.0	57.1
Enhancer	64.6	56.7	39.0	54.0	54.0	55.6
TAM 110	62.2	56.9	40.3	56.0	53.2	56.5
Kalvesta	62.9	58.5	39.0	58.1	53.1	58.3
Yumar	64.6	57.7	36.1	56.5	52.9	57.2
TAM 107	61.4	57.2	39.7	56.4	52.4	56.8
Venango	60.1	58.9	40.3	57.2	51.9	58.2
Halt	61.1	56.8	36.3	55.3	50.8	56.2
Prowers	58.3	59.1	30.8	57.5	47.0	58.4
Wichita	45.2	58.9	29.2	57.9	38.6	58.5

*Varieties in table rank based on 2-Yr average yields.

Table 5. Colorado winter wheat Irrigated Variety Performance Trial summary for 2000.

	Location				Averages			
	Haxtun		Rocky Ford		2000		2-Yr	3-Yr
Variety[1]	Yield	Test Weight	Yield	Test Weight	Yield	Test Weight	1999/00	1998/99/00
	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	--------bu/ac--------	
Venango	129.3	57.4	94.3	56.3	111.8	56.9	92.1	-----
TAM 107	130.0	55.5	91.3	54.5	110.6	55.0	93.4	92.1 [3]
XH9806	126.9	56.6	92.7	54.0	109.8	55.3	-----	-----
XH9801	135.1	57.4	84.3	54.4	109.7	55.9	-----	-----
Yuma	133.6	55.3	83.7	53.7	108.7	54.5	86.4	91.5 [5]
XH3207	127.5	56.4	88.9	57.1	108.2	56.8	-----	-----
XH9815	129.9	56.2	85.8	55.0	107.9	55.6	-----	-----
Jagger	123.8	55.0	86.8	54.3	105.3	54.6	89.4	87.9
XH7463	126.7	56.2	83.0	54.5	104.8	55.4	-----	-----
QAP 7406	130.8	56.0	77.0	55.8	103.9	55.9	88.8	93.8 [1]
QAP 7510	125.8	56.7	80.3	56.2	103.0	56.5	87.4	91.8 [4]
2137	124.2	56.5	80.9	51.6	102.6	54.0	90.5	92.8 [2]
Enhancer	113.2	55.4	87.2	52.0	100.2	53.7	78.8	-----
Q 7588	112.2	55.1	86.3	52.2	99.2	53.6	81.2	-----
G15048	120.7	57.7	76.4	58.2	98.5	57.9	82.4	-----
Trego	108.5	58.4	88.4	56.1	98.5	57.3	-----	-----
Nuplains	107.0	57.0	89.3	55.2	98.1	56.1	-----	-----
Yumar	119.5	54.6	75.0	49.8	97.2	52.2	82.8	88.5
Prairie Red	111.0	56.5	82.0	54.2	96.5	55.3	82.8	87.2
Custer	122.5	56.3	70.1	54.7	96.3	55.5	91.0	90.6
Wesley	117.3	55.4	75.2	53.5	96.2	54.4	-----	-----
Kalvesta	106.4	56.7	81.5	56.6	94.0	56.6	80.6	-----
Akron	106.7	56.5	74.4	53.9	90.5	55.2	79.5	83.9
Cossack	95.5	56.7	77.3	53.2	86.4	55.0	72.2	-----
Average	**120.2**	**56.3**	**83.0**	**54.5**	**101.6**	**55.4**		
CV%	9.0		12.3					
$LSD_{(0.30)}$	9.1		8.8					

[1]Varieties in table ranked by the average yield over two locations in 2000.

[1.....5] Variety rank based on 3-Yr average yields.

Colorado experimental lines not included.

Table 6. Colorado winter wheat Irrigated Variety Performance Trial summary for 1998-00.

	Averages							
	1998		1999		2000		3-Yr	
Variety*	Yield	Test Weight	Yield	Test Weight	Yield	Test Weight	Yield	Test Weight
	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu
QAP 7406	100.6	58.5	73.6	59.2	103.9	55.9	93.8	58.0
2137	95.8	58.6	78.4	60.1	102.6	54.0	92.8	57.7
TAM 107	90.4	58.6	76.2	60.9	110.6	55.0	92.1	58.2
QAP 7510	97.6	59.0	71.8	59.4	103.0	56.4	91.8	58.4
Yuma	98.3	58.3	64.1	59.4	108.7	54.5	91.5	57.5
Custer	90.1	59.1	85.7	60.0	96.3	55.5	90.6	58.3
Yumar	96.0	58.9	68.4	58.8	97.2	52.2	88.5	57.0
Jagger	85.9	58.1	73.4	59.1	105.3	54.6	87.9	57.4
Prairie Red	93.0	58.1	69.1	59.7	96.5	55.4	87.2	57.8
Akron	89.7	58.3	68.4	59.6	90.5	55.2	83.9	57.8

*Varieties in table rank based on 3-Yr average yields.

Table 7. Colorado winter wheat Irrigated Variety Performance Trial summary for 1999-00.

	Averages					
	1999		2000		2-Yr	
Variety*	Yield	Test Weight	Yield	Test Weight	Yield	Test Weight
	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu
TAM 107	76.2	60.9	110.6	55.0	93.4	58.0
Venango	72.4	61.6	111.8	56.9	92.1	59.2
Custer	85.7	60.0	96.3	55.5	91.0	57.8
2137	78.4	60.1	102.6	54.0	90.5	57.1
Jagger	73.4	59.1	105.3	54.6	89.4	56.9
QAP 7406	73.6	59.2	103.9	55.9	88.8	57.6
QAP 7510	71.8	59.4	103.0	56.4	87.4	58.0
Yuma	64.1	59.4	108.7	54.5	86.4	56.9
Yumar	68.4	58.8	97.2	52.2	82.8	55.5
Prairie Red	69.1	59.7	96.5	55.4	82.8	57.5
G15048	66.3	59.0	98.5	58.0	82.4	58.5
Q 7588	63.2	59.7	99.2	53.6	81.2	56.7
Kalvesta	67.3	61.6	94.0	56.6	80.6	59.1
Akron	68.4	59.6	90.5	55.2	79.5	57.4
Enhancer	57.4	58.3	100.2	53.7	78.8	56.0
Cossack	58.0	59.8	86.4	55.0	72.2	57.4

*Varieties in table rank based on 2-Yr average yields.

Table 8. Grain proteins from three UVPT testing locations.

Variety	Burlington	Julesburg	Akron	Average
Prowers	17.9	18.2	18.5	18.2
Prowers 99	17.6	18.2	18.2	18.0
QAP 7510	18.6	17.7	17.7	18.0
CO970498	17.8	17.9	18.3	18.0
Nuplains	18.5	17.1	18.4	18.0
Kalvesta	18.5	17.7	17.4	17.9
Jagger	18.4	17.7	17.6	17.9
G15048	18.1	17.3	17.6	17.7
CO970531	16.9	17.4	18.4	17.6
Halt	17.8	17.9	17.2	17.6
QAP 7406	18.3	17.2	17.2	17.6
Prairie Red	17.9	17.3	17.7	17.6
Q 7588	18.6	17.0	17.2	17.6
Cossack	18.2	16.6	17.6	17.5
Wichita	17.5	17.2	17.6	17.4
TAM 107	17.5	16.7	17.9	17.4
2137	17.6	17.3	17.1	17.3
CO940610	18.2	16.5	17.1	17.3
CO970552	17.5	17.3	17.2	17.3
Enhancer	17.2	17.4	16.9	17.2
Venango	17.2	17.3	17.0	17.2
Stanton	17.4	17.0	16.9	17.1
CO940611	17.5	16.9	17.0	17.1
Trego	17.8	17.4	15.9	17.0
Akron	16.9	17.0	17.0	17.0
Yumar	17.4	16.7	17.0	17.0
CO950043	16.5	17.4	17.2	17.0
Alliance	17.3	16.7	16.6	16.9
Yuma	17.3	16.5	16.8	16.9
CO970547	16.6	16.6	17.4	16.9
TAM 110	16.8	16.1	17.3	16.7
CO980879	16.1	16.4	17.5	16.7
Lakin	17.3	16.4	16.5	16.7
CO980890	16.6	16.6	16.5	16.6
CO980894	16.0	16.8	17.0	16.6
CO980875	17.4	14.7	17.1	16.4
CO980881	15.9	16.6	16.5	16.3
CO980889	15.5	16.8	16.6	16.3
CO960603	16.5	15.9	16.1	16.2
CO970943	15.0	16.1	16.5	15.9
CO970940	15.5	16.1	15.6	15.7
Minimum	**15.0**	**14.7**	**15.6**	**15.7**
Maximum	**18.7**	**18.2**	**18.8**	**18.3**
Average	**17.3**	**17.0**	**17.1**	**17.1**

*Adjusted to 12% moisture basis.

Description of winter wheat varieties in western trials.

Variety Name	Class	Origin
2137	Hard Red	Kansas
Blizzard	Hard Red	Idaho
Boundary	Soft White	Idaho
Brundage	Soft White	Idaho
Fairview	Hard Red	Colorado
Garland	Hard Red	Utah
Golden Spike	Hard White	Utah
Halt	Hard Red	Colorado
Hayden	Hard Red	Colorado/Idaho
ID0513	Hard Red	Idaho
ID0535	Hard Red	Idaho
ID0548	Hard Red	Idaho
ID0549	Hard Red	Idaho
ID0550	Hard White	Idaho
ID0551	Hard White	Idaho
Jeff	Hard Red	Idaho
Madsen	Soft White	Washington
Manning	Hard Red	Utah
OR943575	Hard White	Oregon
OR942496	Hard White	Oregon
Platte	Hard White	Agripro Biosciences Inc.
Prairie Red	Hard Red	Colorado
Presto	Triticale	Colorado
Promontory	Hard Red	Utah
Prowers 99	Hard Red	Colorado
Q 7588	Hard Red	Hybritech
QAP 7406	Hard Red	Hybritech
QAP 7510	Hard Red	Hybritech
Stephens	Soft White	Oregon
Trego	Hard White	Kansas
Tomahawk	Hard Red	Agripro Biosciences Inc.
UT203032	Hard Red	Utah
Utah 100	Hard Red	Utah
Wesley	Hard Red	Nebraska
Yuma	Hard Red	Colorado
Yumar	Hard Red	Colorado
XH 7463	Hard Red	Hybritech (hybrid)
XH 9801	Hard Red	Hybritech (hybrid)
XH 9815	Hard Red	Hybritech (hybrid)

Western Winter Wheat at Hayden

Calvin Pearson and Scott Haley

Summary and Recommendations

Each year small grain variety performance tests are conducted at Hayden, Colorado to identify varieties that are productive and suitable for commercial production in northwest Colorado. Grain yield in the winter wheat variety performance test averaged 23.9 bushels/acre. There were no statistically significant differences among the 20 winter wheat varieties.

Winter Wheat Plots at Hayden

Introduction and Objectives

Growers in northwest Colorado are limited to only a few crops they can grow. The number of crops that are grown in northwest Colorado is limited by environmental constraints created primarily by dryland production conditions, a short growing season, and sporadic and limited precipitation. Farmers are also limited by their isolation to markets for their crops. Growers in northwest Colorado are very supportive of agronomic research that will increase crop yield and grower profits. They are also interested in alternative crops that have potential for production in northwest Colorado. The principle cash crop grown in northwest Colorado is wheat. Alternative small grains, such as malting barley, Triticale, and specialty wheats (i.e., hard white wheats) are of interest to growers because these crops often go into specialty markets that demand a premium price. Alternative crops, such as these specialty small grains, are also of interest because they can be grown with production practices and equipment growers already have on their farm.

Results and Discussion

Precipitation was lower than normal during the critical months of June and July 2000. Environmental conditions were not favorable for wheat production in the Hayden area in 2000. The low precipitation during the 2000 growing season resulted in low grain yields. Precipitation in the Craig/Hayden area varies greatly from month to month and is the most limiting factor to dryland grain yields in the area.

Grain moisture in the winter wheat variety performance test at Hayden averaged 11.2%. Fairview had the highest grain moisture (12.6%) while most other varieties had grain moisture contents lower than 11.3%. Grain yields of the twenty winter wheat varieties averaged 23.9 bu/acre. There were no statistically significant differences in grain yield among the varieties. Most varieties had test weights greater than 59 lbs/bu. Varieties with test weights lower than 58 lbs/bu were OR943575, Presto Triticale, and Fairview. Six varieties were taller than other varieties (Presto, Utah 100, UT203032, Jeff, Golden Spike, and Hayden). Seven varieties were shorter than other varieties (Manning, Boundary, Promontory, IDO513, IDO548, IDO550, and OR942496). There was no lodging among the winter wheat varieties in 2000.

Table 9. Colorado winter wheat Dryland Variety Performance Trial at Hayden[1] in 2000.

Variety	Yield	Grain Moisture	Test Weight	Plant Height
	bu/ac	%	lb/bu	in
Golden Spike	31.7	11.1	60.2	26.4
OR942496	31.1	11.2	60.7	23.3
Boundary	30.3	11.1	59.9	21.4
OR943575	30.2	11.3	56.7	24.2
UT203032	29.0	11.0	61.3	26.6
Promontory	27.9	11.0	62.3	23.1
Presto	27.6	11.0	55.1	27.9
IDO551	24.7	11.3	61.9	24.6
IDO535	24.6	11.0	61.4	24.6
Hayden	24.2	10.6	61.4	26.2
Blizzard	23.4	10.9	61.3	23.8
Prowers 99	22.9	11.7	58.6	23.4
Jeff	21.9	10.8	62.0	26.5
Manning	21.6	11.1	61.9	21.5
IDO550	21.2	11.8	59.2	23.3
Utah 100	19.1	10.8	59.6	27.0
IDO548	18.6	10.8	61.5	20.8
IDO513	17.7	11.1	60.6	20.6
Fairview	15.5	12.6	53.5	23.8
IDO549	15.4	11.3	61.3	24.3
Average	**23.9**	**11.2**	**60.0**	**24.2**
CV%	36.4	5.0	3.9	7.9
$LSD_{(0.05)}$	NS	0.8	3.3	2.7

[1]Trial conducted on the Jim Denker farm; seeded 10/06/99 and harvested 8/21/00.

[2]0.2 = no lodging, 9.0 = totally area lodged flat.

Western Winter Wheat at Fruita

Calvin Pearson and Scott Haley

Summary and Recommendations

Each year small grain variety performance trials are conducted at the Western Colorado Research Center at Fruita to identify varieties that are productive and adapted for commercial production in western Colorado. Grain yields in the winter wheat variety performance test averaged 122.7 bu/acre and three of the sixteen entries were high yielding (Prairie Red, Wesley, and OR943575).

Introduction and Objectives

Small grains are routinely produced in western Colorado. These crops are often used for rotational purposes and to meet other farm needs. For example, oats may be planted to feed on-farm animals, or winter wheat may be planted as a rotational crop prior to fall planting alfalfa. Farmers require up-to-date and local, site-specific information to assist them when choosing small grain varieties to plant. The objective of this research was to evaluate winter wheat varieties for their performance under western Colorado conditions.

Results and Discussion

Grain moistures among winter wheat varieties in 2000 were statistically significant (Table 10). Eight winter wheat varieties had grain moistures ranging from 8.5 to 8.8% and four varieties had moistures ranging from 8.1 to 8.4%. Average grain moisture was 8.5%. Grain yield averaged 122.7 bu/acre. Grain yields in the 2000 test were slightly lower than in 1999. Three of the sixteen winter wheat entries were high yielding (Prairie Red, Wesley, and OR943575). Ten varieties had test weights greater than 60 lbs/bu and six varieties had test weights lower than 60 lbs/bu. ID0549 was the tallest and Garland was the shortest variety. Three winter wheat entries (ID0535, ID0548, and ID0550) had higher lodging scores compared to other entries. Ten wheat varieties had lodging scores less than 2.0. Five entries required more than 131 days from Jan.1 to reach heading and four entries (Prairie Red, Halt, 2137, and Wesley) required the least number of days to reach heads compared to other varieties. Prairie Red, Halt, Wesley, and ID0513 had protein concentrations greater than 12%. Eleven varieties had hardness values greater than 40. Brundage, a soft white winter wheat, had the lowest hardness value.

White Spike

Table 10. Colorado winter wheat Irrigated Variety Performance Trial at Fruita[1] in 2000.

Variety	Yield	Grain Moisture	Test Weight	Plant Height	Lodging[2]	Days to Heading[3]	Protein	Hardness[4]
	bu/ac	%	lb/bu	in	0.2-9.0	no. of days	%	rating
Prairie Red	154.3	8.1	61.2	35.1	1.9	124	13.2	29
Wesley	150.4	8.5	60.8	32.1	0.8	125	12.0	70
OR943575	143.6	8.6	58.5	35.1	1.7	134	9.8	55
Madsen	130.6	8.5	61.4	36.9	0.6	134	11.2	18
Brundage	127.7	8.7	60.6	34.5	0.2	130	10.8	-2
Garland	127.1	8.4	57.6	27.9	0.2	132	11.9	49
OR942496	125.5	8.6	61.4	36.6	0.8	130	11.1	43
Halt	124.5	8.1	60.6	34.5	2.9	124	12.5	53
Stephens	124.4	8.4	58.5	33.9	2.3	128	10.7	26
2137	120.2	8.3	61.0	34.8	1.1	126	10.0	75
ID0551	117.7	8.8	60.2	38.4	1.0	131	10.8	49
ID0513	113.7	8.4	60.6	40.8	3.6	131	12.3	30
ID0550	109.9	8.4	59.3	40.2	6.0	131	9.5	59
ID0548	107.1	8.5	59.4	37.5	5.0	130	10.1	59
ID0549	97.0	8.5	60.7	44.1	0.7	133	10.4	51
ID0535	89.2	8.6	58.2	38.4	6.6	133	11.1	46
Average	**122.7**	**8.5**	**60.0**	**36.3**	**2.2**	**130**		
CV%	9.5	2.6	2.2	4.3	57.5	1.2		
$LSD_{(0.05)}$	16.6	0.3	1.9	2.2	1.8	2.2		

[1]Trial conducted at the Western Colorado Research Center; seeded 10/01/99 and harvested 7/22/00.
[2]0.2 = no lodging, 9.0 = totally area lodged flat.
[3]From January 1.
[4]Reading of <40 indicates soft wheat and reading of >40 indicates hard wheat.

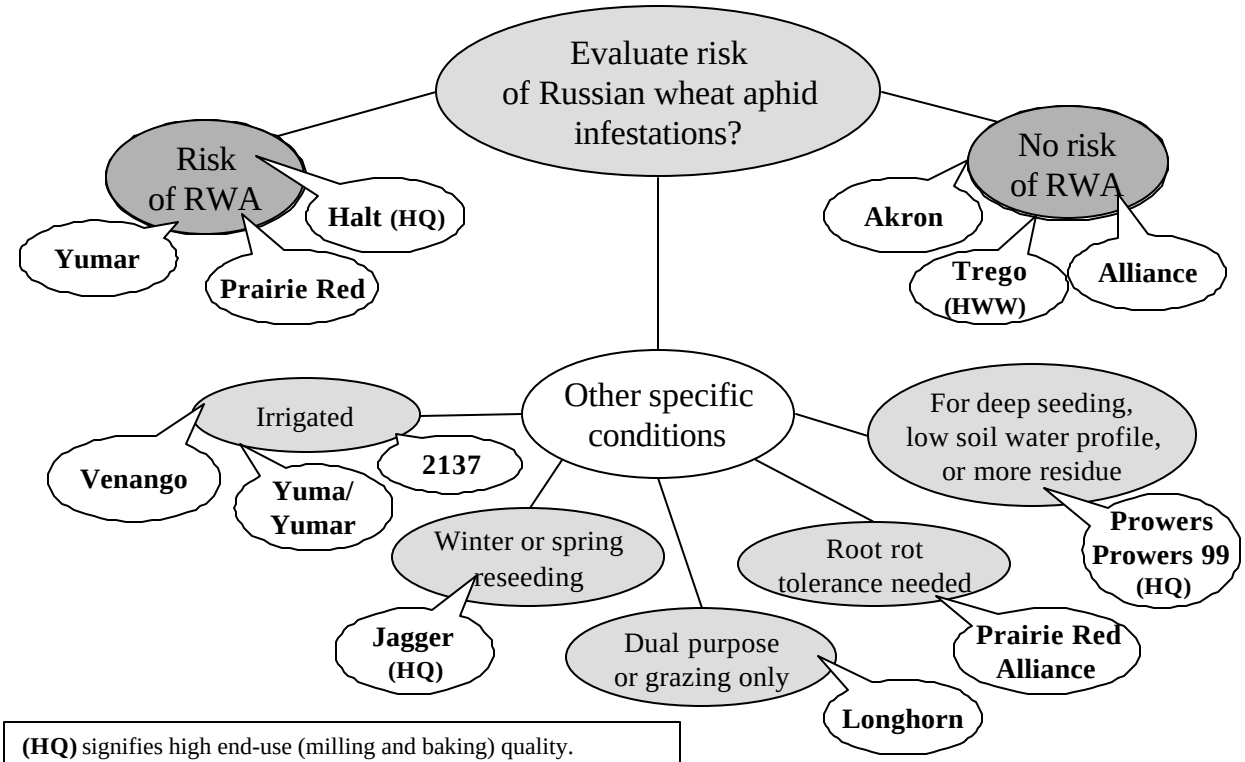
Table 11. Colorado winter wheat Irrigated Variety Performance Trial at Center[1] in 2000.

Variety	Yield	Test Weight	Heading Date	Plant Height	Lodging	Grain Protein	Grain Hardness[2]	3-Yr Avg Yield
	bu/ac	lb/bu	(June)	in	%	%	rating	bu/acre
Tomahawk	164.6	60.0	6.3	39.3	15.0	10.7	53	124.2
Prairie Red	164.6	60.4	8.3	38.4	0.0	10.5	63	133.0
QAP 7406	162.3	59.6	9.3	39.6	0.0	9.5	50	146.5
Platte	161.9	61.0	11.5	36.3	0.0	10.1	48	125.9
XH 9801	160.1	60.3	12.3	40.2	0.0	10.7	51	---
Q 7588	159.9	59.3	10.8	40.8	0.0	9.2	58	---
QAP 7510	155.6	61.3	12.5	37.5	0.0	10.8	59	129.2
Yuma	155.6	59.7	11.8	42.3	37.5	10.3	43	137.5
XH 7463	155.5	60.0	11.0	39.9	0.0	9.3	50	---
Halt	154.1	58.3	11.5	41.1	12.5	11.0	52	138.1
Yumar	152.9	59.5	11.5	42.6	36.3	10.2	53	---
XH 9815	148.9	60.1	8.8	38.1	0.0	9.8	51	---
Wesley	146.0	58.4	9.5	35.7	0.0	10.1	52	---
2137	144.8	59.3	13.3	41.1	0.0	10.5	68	---
Trego	140.0	61.1	15.0	41.7	16.3	10.1	51	---
Average	**155.1**	**59.8**	**11.1**	**39.7**	**7.8**	**10.2**	**53.5**	**132.1**
$LSD_{(0.05)}$	12.0	1.2	2.6	2.4	25	NS	NS	---

[1]Trial conducted on the San Luis Valley Research Center; seeded 10/04/99 and harvested 8/15/00.
[2]Grain hardness reading of <40 indicates soft wheat and >40 indicates hard wheat.

Decision Tree for Winter Wheat Variety Selection in Colorado

Jerry Johnson and Scott Haley (July 2000)



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

(HWW) signifies Hard White Winter wheat variety.

The best choice of a winter wheat variety in Colorado depends upon variable production conditions. The decision tree combines our knowledge of wheat varieties with their performance in CSU variety trials. Varieties listed in the decision tree are varieties that we think growers should consider for the production conditions specified in the tree. Production risks may be reduced by planting more than one variety and it should be remembered that avoiding poor variety decisions may be as important as choosing the winner among winners.


John Stromberger demonstrates emasculation of female parent during CWAC tour


Pat Byrne - CSU geneticist

Colorado Winter Wheat Variety Performance Database

Crops Testing and Variety Performance Winter Wheat Breeding and Genetics

Scott Haley and Jerry Johnson

A relational database system accessible over the Internet/Web recently was developed to provide enhanced access to winter wheat variety information from the CSU Variety Performance Trial program. The database system (found at "**http://triticum.agsci.colostate.edu/vpt.html" or through "**www.csuag.com") will be updated annually with new variety information and variety trial data. The database currently consists of the following four components:

Please select from one of the following:

- Winter wheat variety information
- Single location data summaries
- Multiple location data summaries
- Variety head-to-head comparisons

Single Location Summary

The database for single location summaries contains data for all Colorado Variety Trials conducted since 1990. Grain yield and test weight summaries may be generated for individual locations within any year.

To search, specify the desired year and location below. The list of locations displayed will include only those locations applicable to the specific year chosen.

Year:

Locations:

Search

Variety Head-to-Head Comparison

The database for variety head-to-head comparisons contains data for all Colorado Variety Trials conducted since 1990.

To display a head-to-head comparison between two varieties, specify the desired varieties below. The resulting summary table will display grain yield for each variety from all replicated variety trials where the two varieties occurred together. The database calculates the number of trials where the grain yield of Variety 1 exceeded that of Variety 2 and then reports this as a percentage of the total number of trials where the two varieties occurred together.

Please specify below two varieties to compare:

Variety 1:

Variety 2:

Restrict comparison to trials

Search

Winter Wheat Variety Information

Russian Wheat Aphid Resistance

Coleoptile length

Heading date

Leaf rust resistance

Plant height

Wheat streak mosaic virus tolerance

Straw strength

Winterhardiness

Test weight

Grain protein content

Relative milling quality

Relative baking quality

Specify Output Type

Multiple Location Summary

The database for multiple location summaries contains data for all Colorado Variety Trials conducted since 1996. Grain yield and test weight summaries may be generated for specified combinations of years and location.

To search, specify the following criteria:

Tips and Suggestions

Years: (year 1) (year 2) (year 3) (year 4)

! specify as many years as desired.
! do not duplicate selections (e.g., do not select 1999 more than once).

Type of trial: (dryland, irrigated)

! select either "dryland" or "irrigated" is required

Location: (loc 1) (loc 2) (loc 3) (loc 4) (loc 5)

! If locations are unselected, averages will be based on all available trials for the selected years and trial type.

CWAC Invests in CSU Research

Darrell Hanavan

The Colorado Wheat Administrative Committee (CWAC) invested approximately $127,000 in the wheat-breeding program and wheat related research at CSU in the 2000-2001 fiscal year. Each dollar of wheat producer funding provided by CWAC is leveraged with an additional $14 of state and federal funding. As a result, CSU Experiment Station is providing a total of approximately $1.8 million to the wheat breeding program and wheat related research.

CWAC is currently funding the following wheat related research at CSU:

- Development of hard red, hard white, winter and spring wheat varieties with **improved milling and baking qualities**. These varieties are quality tested in domestic and export markets before release by the Wheat Quality Council, the Wheat Marketing Center, and the U.S. Wheat Associates Overseas Varietal Analysis.
- Introduction of genetic **resistance to the Russian wheat aphid** into new varieties.
- Development of wheat varieties that are **herbicide resistant** to allow selective control of winter annual grasses (jointed goatgrass, downy brome and volunteer rye).
- Support of weed science test plot research on **winter annual grasses management** in winter wheat.
- Support of **maximum economic yield** project to increase average yields of irrigated wheat in eastern Colorado.
- Support of CSU **wheat variety testing** program.

Funding for this wheat related research is made possible by the one cent per bushel assessment on wheat. Each assessment dollar contributed by wheat producers to be invested in research is leveraged with an additional $14 of state and federal funding.

Nora Lapitan and Darrell Hanavan

CWRF & CAWG

Darrell Hanavan and Casey Sumpter

Colorado Wheat Research Foundation (CWRF)

CWRF is a nonprofit corporation developed by the Colorado Wheat Administrative Committee (CWAC) to further educational and scientific programs related to wheat. As part of a historic 1995 agreement, CWRF now acquires ownership and proprietary protection of new wheat varieties developed at Colorado State University (CSU) and collects royalties from the sale of certified seed. These royalties are returned to CSU to support the wheat-breeding program and wheat related research.

In 1995, Halt became the first variety included in the Colorado Wheat Cultivar Program. Halt was developed by CSU as the first winter wheat resistant to the Russian wheat aphid. Yumar and Prowers were added to the program in 1997. Prairie Red was added in 1998 and Prowers 99 in 1999. The Colorado Wheat Cultivar Program added more than $51,000 last year and $100,000 this year to support the wheat breeding program and wheat related research, in addition to funding provided by CWAC to CSU.

Colorado Association of Wheat Growers (CAWG)

CAWG is a voluntary dues-paying membership association that provides special programs and benefits to members. Benefits include membership in the National Association of Wheat Growers (NAWG) and an exceptional Workers' Compensation Safety Dividend Program. CAWG represents its members at the state government level, while NAWG represents them at the national level.

At the national level, National Association of Wheat Growers (NAWG) and its 23 state associations, including CAWG, worked hard last year to bring about the farm assistance package that distributed approximately **$56 million to Colorado wheat farmers.** The package included: 1) Financial assistance equal to 100% of 1999 payments 2) Agricultural Marketing Transition Act (AMTA) payments (63.7 cents for wheat) 3) Advancing the FY2001 AMTA payments to October 1, 2000 and 4) Reform of Federal Crop Insurance to reduce premiums and increase coverage.

Managing Nitrogen to Maximize the Return on Your Fertilizer Investment

Jessica Davis and Dwayne Westfall

With fertilizer prices at least 50% higher this year than last, it's critical to spend your fertilizer dollar wisely. Here are a few options which may help you get the most yield and protein from your fertilizer investment.

1) **Soil sample**
Soil sampling costs about $1.00-$2.50 per acre. If your test results cause you to reduce your N fertilization rate by 10 lbs or more per acre, you'll be saving money in the long run, based on today's prices.

2) **Fertilizer type**
In spite of the higher N prices, anhydrous ammonia is still the cheapest per pound of N, and ammonium nitrate is still the most expensive, with UAN and urea in between these extremes. Assuming proper fertilizer placement, there is no difference in the effectiveness of different N sources.

3) **Fertilizer placement**
Be sure to place your fertilizer appropriately in order to reduce N volatilization losses to the air. Anhydrous ammonia should be placed 4-6 inches deep. Volatilization risk is high when surface applying UAN and urea during hot weather. Early spring applications usually do not result in significant volatilization losses. Banding will reduce N loss, and subsurface banding will conserve even more N for use by the crop, thus increasing fertilizer efficiency.

4) **Timing of fertilizer application**
A 3-year study at 19 sites around eastern Colorado showed that under conventional tillage, spring-applied N increased both grain yield and protein more than the same amount of fall-applied N. Fall-applied N requires about 20% more N to achieve the same yield and quality as spring-applied N. Therefore, you'll get more return on your fertilizer investment if you wait till spring greenup to apply. In addition, if winter precipitation is inadequate or other factors limit your stand or yield potential, you can reduce your N fertilizer rate accordingly in the spring. Applying N in the fall involves greater risk because you don't know what conditions and yield potential will be in the spring. For spring topdressing, apply up to 60 lbs N/acre as UAN (dribbled on) or broadcast ammonium nitrate if it's windy.

5) **Selection of fields to fertilize**
Apply fertilizer on fields with the greatest probability of response. In general, the lower the soil nitrate level, soil organic matter content, or grain protein concentration (below 12%), the greater your chances of getting a yield and/or protein response to N application. However, if something else is limiting yield, like drought, pests, hail, or poor soil quality (on knolls, for example), applying N will not overcome those limitations. Don't waste your money on N in these situations.

6) **Applying N to get a protein premium**
It takes 20-30 lbs N/acre to increase protein by 1% (above 12%). Compare today's fertilizer cost with your protein premium and see if it will pay off for you.

With energy and fertilizer prices up, farmers need to do all they can to be sure their fertilizer investment pays off. Consider the above options when making your fertilizer decisions this year.

Weed Science Update

Phil Westra and Tim D'Amato

New Herbicide Use in Wheat

Aim – (FMC Chemical Co.), is labeled for broadleaf weed control in wheat and barley. This product is a contact, or burn-down type herbicide with no residual activity. Coverage is critical and weed size should be four inches or less for effective results. Aim may be applied as a tank mix partner with other herbicides registered for use in wheat.

Maverick – (Monsanto Chemical Co.), is labeled for use in wheat in wheat/fallow rotations. Maverick is a selective herbicide for control of annual brome species (in the Great Plains region - downy brome, cheatgrass, Japanese brome), as well as control of flixweed and pennycress, and suppression of blue mustard. Maverick provides post and soil residual activity, and is most effective when applied in the fall.

Paramount – (BASF Chemical Co.), is labeled for use in fallow with rotation to wheat or milo, pre-emergence to wheat or milo, and in-crop milo. Paramount has excellent residual activity and is effective for management of field bindweed, as well as providing control of barnyard grass and foxtail species. The Paramount label is expected to be expanded to in-crop wheat, and rotations that include millet and corn.

Starane – (United Agri Products), is a post emergence herbicide registered for use in small grains. Starane has excellent crop safety in wheat, barley, and oats and applied in a tank mix with 2,4-D or MCPA will provide control of a wide spectrum of susceptible broadleaf weeds.

Clearfield Wheat – BASF and regional universities are developing "IMI Wheat" or wheat lines resistant to imidazolinone herbicides. Clearfield wheat is developed for resistance by way of selection, not gene insertion, and is not classified as a GMO (genetically modified organism). Locally adapted Clearfield wheat seed should be available in the Central Great Plains Region by planting time in 2002. The herbicide labeled for use in Clearfield wheat goes by the trade name **Beyond** and provides selective control of winter annual grasses such as downy brome, jointed goatgrass, and feral rye.

Integrated Management Systems – A large-scale experiment near Platner, CO, is evaluating the effects of cultural practices (variety, tillage, plant density, date of planting, and nitrogen application) on severity of jointed goatgrass infestation. No-till increased jointed goatgrass reproductive tillers over that of conventional-tillage or reduced-tillage. Increasing planting rate from 40 to 60 lb/ac decreased jointed goatgrass growth characteristics. Delayed planting resulted in lower wheat yields and more jointed goatgrass. The variety "Akron" yielded the highest, however "TAM 107" seemed to suppress jointed goatgrass infestations.

Implementation of Best Management Practices for Management of Jointed Goatgrass – The National Jointed Goatgrass Research Program has funded the establishment of four large scale, on-farm trials in the Great Plains for economic analysis and demonstration of current practices compared to new integrated approaches. Crop rotations and cropping systems have been adapted to environmental conditions and surrounding cultural practices of each cooperator. Results are not yet available but field days will be held at several of these sites this summer.

Wheat Disease Update

Bill Brown and Joe Hill

The wheat crop on the High Plains of Colorado usually does not have major disease problems. Tan spot, powdery mildew, septoria, and rust are fungal foliar diseases that can be found in Colorado, especially the Northeast area. They occur in very low incidences but usually cause no significant yield losses because of unfavorable environmental conditions. Higher incidences of these diseases may be found where wheat is grown under irrigation. As agriculture systems evolve and more wheat is grown under pivot irrigation it will be necessary to carefully monitor the crop throughout the season for both an increase in leaf diseases and also root rot diseases like take-all and Cephalosporium.

Colorado has experienced an increase in foliar mosaic virus diseases of wheat over the last several years. This past year was an exception in many areas due to the extended drought conditions. Wheat Streak Mosaic virus (WSMV), Barley Yellow Dwarf Virus (BYDV), and High Plains Disease Virus (HPDV) may become increasingly significant problem problems in Colorado. Both WSMV and HPDV viruses have the same wheat curl mite as a vector. The mites and the viruses survive in both wheat and corn. WSMV (and by implication HPDV) has traditionally been managed with a system of volunteer elimination and delayed planting. The increase in dryland corn is providing the "green tissue bridge" for both the viruses and the vector. The increased acreage of corn maturing later in the season may be, in fact, pushing the vector migration to the wheat later in the season. Late planted winter wheat may be at its most susceptible stage just as the mites are leaving the corn. Foliar mosaic virus symptoms in wheat near

dryland corn have been increasing. It must be noted that this is a preliminary observation and has not been validated by research. This highlights the need to pursue appropriate research to define what viruses, if any, are building up in dryland corn and then moving into wheat.

The impact of the increasing acreage going to minimum tillage on wheat disease development is continuing to elicit concern among growers. This is a valid concern when viewed from the perspective of recent events in the Red River Valley of North Dakota and Minnesota where highly damaging attacks of Fusarium scab have caused significant losses. This problem developed because several things come together at the same time. Increased minimum tillage, a corn/small grain rotation with both crops hosting the Fusarium scab fungus and the increased frequency of rainfall during the wheat flowering period. It is unlikely such a situation would develop in Colorado even though we are seeing a significant increase in a dryland corn/wheat rotation. We have monitored the Petersen/ Westfall farming systems experiments for over seven years and have yet to find any significant increased disease development in the wheat. The key to keeping disease incidence low is reducing stress on the wheat by increasing moisture retention and availability and the dry air.

Three Mites that Affect Colorado Wheat

Frank Peairs

Wheat curl mites are microscopic organisms found on wheat and other nearby perennial grasses. They are important as vectors of wheat streak mosaic, an important viral disease of wheat in Colorado. Wheat curl mites develop under leaf sheaths, inside newly emerged leaves, and eventually on green tissues in the head. They cause a tight rolling of the leaf margin in contrast to the looser roll of the entire leaf caused by Russian wheat aphid. Wheat curl mites are moved by wind currents to their summer grass hosts and back to wheat in the fall.

Preventive controls should be used in high risk areas where wheat was damaged by hail after heading or where wheat will emerge before adjacent corn dries down. Volunteer management is a key preventive measure for the mite and wheat streak mosaic. Some effective varietal resistance to the mite, such as that found in 'TAM 107', is available and resistance to the virus will be available soon.

Brown wheat mite spends the summer in the soil as white eggs, which hatch in the fall as cooler, wetter conditions return. Red eggs are laid in the next generation, which hatch quickly. Brown wheat mites feed on plant sap during the day and spend the night in the soil. Their activity peaks at about mid-afternoon on warm, calm days (the best time to scout). This mite is not affected by cold temperatures, but populations are quickly reduced by driving rains of **a** inch or more. Management of volunteer wheat and reducing drought stress are important preventive measures. Consider chemical control if there are 2-300 mites per row-foot in early spring. This figure will increase with lower wheat price and yield expectations and decrease with higher prices and yield potential. If white eggs are present and red eggs are mostly hatched, the population is in natural decline and treatment is not economically justifiable.

Banks grass mites move into winter wheat from field corn in the fall and remain in the crowns of wheat plants where they feed until spring. Small pearly white eggs then are laid that mature into pale to bright green male and female adults. They produce heavy webbing to protect colonies consisting of eggs, immatures and adults. Colonies usually are found on the undersides of leaves. Damaged leaves first become yellow, then brown and necrotic. Heavy populations can kill small plants and reduce kernel size in larger plants. Damage to wheat occurs mostly near maturing field corn. Insecticide applications to field margins bordering corn are often sufficient to prevent economic damage. Spring infestations are not common in the state.

It Pays to Plant Certified Seed!

Gil Waibel

It pays to plant Certified seed despite farmers who still believe in using bin-run seed. We often have seed lots believed to be of high quality that fail to germinate well, or noxious weed seeds are found in the lot. Much planning and effort are required to produce high quality seed. Wet storage conditions will lead to heated seed and lowered germination. Storage conditions also affect seed vigor. High seedling vigor allows the seedling to perform in stressful conditions and produce a good, uniform, and fast-growing stand. It is possible to have high percent germination and low seed vigor which performs poorly in the field. When seed is too dry, it may be susceptible to mechanical damage. Certified seed must be found to be free of noxious weed seed. If you plant bin-run seed containing noxious weed seed, you could end up paying much more to eradicate the problem than the few additional cents needed to purchase Certified seed.

The Foundation Seed Project is growing two new varieties for possible release of the Foundation Seed Class this fall. One white wheat, CO940611, looks very promising. The other lines CO980889 and CO980894 are hard red winter wheat lines that are tolerant to the Imidazolinone class of herbicides.

All growers who are interested in becoming participants in Colorado Wheat Research Foundation (CWRF) owned varieties may contact the CSGA office at (970) 491-6202 for information about the program. Seed directories will be available from the CSGA office in August which will help you find growers who have grown the varieties you are interested in.