Northwestern Agricultural Research Center
of the
Department of Research Centers
Montana Agricultural Experiment Station
Montana State University

ANNUAL REPORT
2005 CROP YEAR

Prepared by

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NORTHWESTERN AGRICULTURAL RESEARCH CENTER
STAFF 2005

Full Time Staff Members	**Years in Service**
Duane L. Johnson – Superintendent & Associate Professor of Agronomy/Plant Breeding Began January 2001	4
Robert N. Stougaard – Professor, Weed Science Began November 1991	14
Qingwu Xue – Research Associate Began February 2000	5
Louise M. Strang – Research Associate Began May 1983	22
Fernando R. Guillen-Portal – Post-doctoral Research Scientist Began July 2002	3
Gary R. Haaven – Ag Research Specialist Began April 1982	23
Barbara F. Honeycutt – Administrative Support Began December 1999	5
Paul P. Koch – Ag Research Technician Began May 1995	9
Janice Haaven – Research Aide Began March 2003	3

Vern R. Stewart – Professor Emeritus
Leon E. Welty – Superintendent Retired

Part Time Employees

Sarah Gunderson (October-June, September)
Margaret Sand (January-September)

Student Employees

Laramy Applekamp (June-August)
Carrie Donat (May-August)
Jane Johnson (June-August)
Lisa Stickel (June-August)

CLIMATOLOGY

Weather information as recorded at the
Northwestern Agricultural Research Center, Kalispell, Montana.

CLIMATOLOGICAL OVERVIEW 2005
NORTHWESTERN AGRICULTURAL RESEARCH CENTER
Kalispell, Montana

The 2004/2005 crop year began with a slightly wetter than normal September and October. The combined September-October accumulation was 3.51 inches, contrasting with an average combined accumulation of 2.93 inches. Beginning in November, moisture fell off and by the end of May we were 1.56 inches less than average based on the past 25 years. June brought over 8.4 inches of precipitation setting an all-time record. The previous record of 6.6 inches had held since June 1966. June rain brought the accumulated precipitation for the crop year to 17.3 inches, 3.72 inches above the average accumulation for the end of June. July and August precipitation fell significantly below 25-year averages so that the 2005 crop year ended just 1.67 inches above the average.

In terms of temperature, the October 2004-September 2005 average was 43.6°F, compared to the 21-year average of 43.3°F. The last recorded frost was May 24, with the first frost of the fall recorded on September 24. This gave the 2005 growing season 122 frost-free days compared to the long-term average of 127.

Growing degree days (GDD) were recorded May through August. The total GDD for crop year 2005 was 1483, using a 50°F base. An additional 259 GDD were picked up in September.

Summary of Climatic Data by Months for the 2004-2005 Crop Year - September 2004 - August 2005 and Averages for the Period 1949-2005 at the Northwestern Agricultural Research Center
Kalispell, Montana

ITEM	Sept. 2004	Oct. 2004	Nov. 2004	Dec. 2004	Jan. 2005	Feb. 2005	Mar. 2005	Apr. 2005	May 2005	June 2005	July 2005	Aug. 2005	Total or Average
Precipitation (inches)													
Current Year	1.89	1.62	0.84	1.49	1.38	0.01	1.41	2.21	1.73	8.44	0.26	0.60	21.88
Avg. 1980-81 to 2004-05	1.65	1.28	1.60	1.49	1.33	1.15	1.41	1.83	2.40	3.16	1.68	1.23	20.21
Average Temperature (F)													
Current Year	52.3	43.4	33.8	29.4	20.6	30.6	36.1	43.9	51.8	55.3	62.6	62.8	43.6
Avg. 1980-81 to 2004-05	53.6	42.2	32.4	24.6	24.5	27.2	35.0	43.4	51.5	57.6	63.8	63.4	43.3

Last killing frost in spring

Spring 2005	May 24, 2005
Median for 1980-2005	May 21, 2005

First killing frost in fall

Fall 2005	September 24
Median for 1980-2005	September 13

Frost Free Period	122
Avg. 1980-2005	127

Growing Degree Days (base 50):	April 1, 2005 - August 30, 2005	1,483 degree days	September 259 degree days
Growing Degree Days (base 32):	April 1, 2005 - August 30, 2005	3,655 degree days	September 968 degree days

Maximum summer temperatur 95°F August 1, 2005

Minimum winter temperature -21°F January 15, 2005

In this summary 32 degrees is considered a killing frost.

Summary of Precipitation at the Northwestern Agricultural Research Center On a Crop Year Basis

Total Precipitation in Inches by Year and Month

YEAR	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	TOTAL
1980-81	1.20	0.83	0.78	2.58	1.81	1.85	2.17	1.75	3.86	4.70	1.17	0.96	23.66
1981-82	0.77	0.56	1.49	1.91	2.38	1.48	1.16	1.60	1.25	2.41	2.06	1.17	18.24
1982-83	2.37	0.75	1.39	1.60	0.93	0.85	1.71	2.41	1.20	2.96	3.66	1.16	20.99
1983-84	1.70	1.13	1.96	2.57	0.80	2.19	1.81	1.93	2.91	2.07	0.31	0.55	19.93
1984-85	2.15	2.25	1.40	1.29	0.31	1.28	0.90	1.31	2.81	1.89	0.35	1.62	17.56
1985-86	5.35	1.55	1.61	0.51	2.39	2.33	0.50	1.34	2.92	1.83	2.09	0.81	23.23
1986-87	3.63	0.80	1.78	0.63	0.38	0.46	3.47	1.15	1.89	1.95	4.85	0.98	21.97
1987-88	0.81	0.12	0.91	1.18	0.98	1.03	0.77	1.36	3.60	1.98	1.07	0.13	13.94
1988-89	2.30	0.62	1.39	1.69	1.39	1.48	2.29	1.09	2.70	2.05	2.70	3.69	23.39
1989-90	1.50	2.29	3.75	1.92	0.96	1.00	1.76	1.63	3.74	2.68	2.34	2.44	26.01
1990-91	T	2.32	1.37	2.60	1.41	0.41	0.72	1.21	2.72	5.36	0.77	1.15	20.04
1991-92	0.80	0.75	2.26	0.58	1.17	0.61	0.83	1.18	1.65	5.34	2.24	0.94	18.35
1992-93	1.21	1.07	2.37	1.53	1.68	0.60	0.73	3.77	2.22	4.00	7.00	1.19	27.37
1993-94	1.54	0.83	1.23	1.27	1.43	1.49	0.11	2.01	1.79	2.59	0.10	0.23	14.62
1994-95	0.46	2.12	1.89	1.07	1.17	0.90	2.33	2.25	1.44	5.63	1.91	1.47	22.64
1995-96	1.21	2.75	2.33	1.91	2.22	1.18	1.19	3.32	4.58	2.05	0.95	0.80	24.49
1996-97	2.67	1.58	3.99	3.52	1.50	1.62	1.18	1.69	2.62	3.41	0.99	1.94	26.71
1997-98	2.36	0.94	0.33	0.42	0.77	0.33	2.64	1.80	5.14	4.64	1.18	0.72	21.27
1998-99	1.48	0.71	1.11	1.47	1.05	1.18	0.90	0.55	1.32	2.74	1.63	1.93	16.07
1999-00	0.36	1.72	2.33	1.08	1.46	1.81	1.30	2.21	0.89	1.80	0.84	0.35	16.15
2000-01	1.40	1.23	0.62	1.23	0.75	1.54	1.03	2.62	0.57	3.29	0.91	0.54	15.73
2001-02	0.32	1.80	1.44	0.59	1.21	1.66	1.48	0.91	2.72	2.39	1.45	1.44	17.41
2002-03	1.18	0.25	0.87	1.67	1.63	1.01	2.32	2.23	1.78	1.57	0.05	0.35	14.91
2003-04	2.56	1.29	0.59	1.04	2.02	0.42	0.57	2.23	1.97	1.31	1.24	3.60	18.84
2004-05	1.89	1.62	0.84	1.49	1.38	0.01	1.41	2.21	1.73	8.44	0.26	0.60	21.88
MEAN	1.65	1.28	1.60	1.49	1.33	1.15	1.41	1.83	2.40	3.16	1.68	1.23	20.22
	SEPT	OCT	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	TOTAL

Mean precipitation for all crop years = 20.22

Precipitation by Day for Crop Year September 2004 - August 2005
Northwest Agriculture Research Center, Kalispell Montana

DAY	SEPT. 2004	OCT. 2004	NOV. 2004	DEC. 2004	JAN. 2005	FEB. 2005	MAR. 2005	APR. 2005	MAY 2005	JUNE 2005	JULY 2005	AUG. 2005	
1				T	0.01					0.43	T	0.02	
2			0.05		0.01					1.62		T	
3	T		0.05		0.01					1.17	T		
4					0.02			0.08	0.06	0.01			
5				0.05				0.05		0.22			
6					0.01					0.05			
7		0.03		0.12	0.09				0.06	0.35			
8				0.20	0.15			0.84	0.51	0.26			
9	0.01	0.02		0.10	0.30				0.01	0.05	0.10		
10		0.01		0.33	0.02					0.14	0.16		
11		0.53		0.05	0.01					0.01		0.01	
12		0.45					0.04	T		0.78		T	
13	0.48	0.05			0.03			0.31	T	0.25		0.18	
14	0.20						T	0.63				T	
15	0.37	0.26		0.01		0.01		0.02	0.12	T			
16	0.20	0.22			0.11				T				
17	0.03		0.02		0.08		0.33	0.11	0.47	T			
18				T	0.35		0.18	0.07	0.01	0.75		0.12	
19	0.19		0.01		0.17		0.24		0.10	0.80		0.04	
20	0.27			0.02			0.17		T				
21	0.14			0.05			0.03		0.12				
22			0.02	0.08			T		0.10				
23			T		0.01		T		0.10	T			
24			0.25	0.03	T							0.19	
25			0.29	0.05					0.07	0.01		0.04	
26			0.15	0.04									
27							0.16	0.10					
28					T		0.18			0.52			
29		0.02					0.01			0.98			
30		0.01		0.17			0.07			0.04			
31		0.02		0.19			T						
													Year Total
TOTAL	1.89	1.62	0.84	1.49	1.38	0.01	1.41	2.21	1.73	8.44	0.26	0.60	21.88

YEAR 2005 - GROWING DEGREE DAYS APRIL THROUGH SEPTEMBER 2005
Calculated at Both Base 50 and Base 32

April	MAX	MIN	Base 50	Base 32
1	49	33	0.0	9.0
2	50	34	0.0	10.0
3	46	30	0.0	7.0
4	48	31	0.0	8.0
5	48	31	0.0	8.0
6	51	27	0.5	9.5
7	63	27	6.5	15.5
8	66	27	8.0	17.0
9	67	26	8.5	17.5
10	67	26	8.5	17.5
11	55	27	2.5	11.5
12	53	27	1.5	10.5
13	54	27	2.0	11.0
14	55	28	2.5	11.5
15	55	28	2.5	11.5
16	51	34	0.5	10.5
17	66	41	8.0	21.5
18	49	33	0.0	9.0
19	51	37	0.5	12.0
20	57	38	3.5	15.5
21	55	35	2.5	13.0
22	64	33	7.0	16.5
23	66	34	8.0	18.0
24	68	36	9.0	20.0
25	71	37	10.5	22.0
26	70	38	10.0	22.0
27	66	37	8.0	19.5
28	46	20	0.0	7.0
29	47	23	0.0	7.5
30	49	24	0.0	8.5
	AV	AV	Total	Total
	56.8	31.0	110.5	397.5

May	MAX	MIN	Base 50	Base 32
1	55	28	2.5	11.5
2	59	28	4.5	13.5
3	63	35	6.5	17.0
4	59	41	4.5	18.0
5	62	39	6.0	18.5
6	66	43	8.0	22.5
7	64	49	7.0	24.5
8	58	47	4.0	20.5
9	62	39	6.0	18.5
10	62	47	6.0	22.5
11	59	36	4.5	15.5
12	62	33	6.0	15.5
13	67	40	8.5	21.5
14	68	41	9.0	22.5
15	66	44	8.0	23.0
16	65	46	7.5	23.5
17	61	45	5.5	21.0
18	58	38	4.0	16.0
19	61	41	5.5	19.0
20	64	35	7.0	17.5
21	56	41	3.0	16.5
22	60	44	5.0	20.0
23	54	54	4.0	22.0
24	62	31	6.0	15.0
25	61	35	5.5	16.0
26	66	35	8.0	18.5
27	73	36	11.5	22.5
28	76	41	13.0	26.5
29	81	46	15.5	31.5
30	72	42	11.0	25.0
31	72	38	11.0	23.0
	AV	AV	Total	Total
	63.4	39.9	214.0	618.5

June	MAX	MIN	Base 50	Base 32
1	65	48	7.5	24.5
2	50	45	0.0	15.5
3	50	45	0.0	15.5
4	53	48	1.5	18.5
5	65	41	7.5	21.0
6	75	44	12.5	27.5
7	57	43	3.5	18.0
8	49	42	0.0	13.5
9	55	43	2.5	17.0
10	55	45	2.5	18.0
11	64	43	7.0	21.5
12	64	44	7.0	22.0
13	53	43	1.5	16.0
14	65	36	7.5	18.5
15	66	42	8.0	22.0
16	69	41	9.5	23.0
17	72	46	11.0	27.0
18	58	46	4.0	20.0
19	61	45	5.5	21.0
20	70	42	10.0	24.0
21	83	48	16.5	33.5
22	85	55	20.0	38.0
23	82	52	17.0	35.0
24	72	41	11.0	24.5
25	73	50	11.5	29.5
26	72	47	11.0	27.5
27	70	46	10.0	26.0
28	70	53	11.5	29.5
29	65	52	8.5	26.5
30	66	50	8.0	26.0
	AV	AV	Total	Total
	65.1	45.5	233.5	700.0

July	MAX	MIN	Base 50	Base 32
1	M	M	0.0	0.0
2	77	55	16.0	34.0
3	69	40	9.5	22.5
4	72	44	11.0	26.0
5	76	47	13.0	29.5
6	81	53	17.0	35.0
7	80	51	15.5	33.5
8	82	47	16.0	32.5
9	85	54	19.5	37.5
10	62	50	6.0	24.0
11	68	51	9.5	27.5
12	79	49	14.5	32.0
13	89	52	19.0	37.0
14	81	49	15.5	33.0
15	79	48	14.5	31.5
16	86	56	21.0	39.0
17	75	52	13.5	31.5
18	72	47	11.0	27.5
19	83	56	19.5	37.5
20	84	48	17.0	34.0
21	88	47	18.0	34.5
22	90	51	18.5	36.5
23	80	46	15.0	31.0
24	83	53	18.0	36.0
25	83	45	16.5	32.0
26	74	43	12.0	26.5
27	78	45	14.0	29.5
28	83	47	16.5	33.0
29	90	50	18.0	36.0
30	90	49	18.0	35.5
31	89	49	18.0	35.5
	AV	AV	Total	Total
	77.7	47.5	461.0	971.0

Aug	MAX	MIN	Base 50	Base 32
1	95	57	21.5	39.5
2	85	61	23.0	41.0
3	79	44	14.5	29.5
4	82	43	16.0	30.5
5	86	47	18.0	34.5
6	92	48	18.0	35.0
7	91	50	18.0	36.0
8	89	49	18.0	35.5
9	89	52	19.0	37.0
10	85	53	19.0	37.0
11	82	46	16.0	32.0
12	80	49	15.0	32.5
13	58	34	4.0	14.0
14	70	38	10.0	22.0
15	76	41	13.0	26.5
16	83	43	16.5	31.0
17	85	50	17.5	35.5
18	70	47	10.0	26.5
19	66	40	8.0	21.0
20	75	41	12.5	26.0
21	81	44	15.5	30.5
22	90	50	18.0	36.0
23	82	50	16.0	34.0
24	70	46	10.0	26.0
25	62	41	6.0	19.5
26	72	40	11.0	24.0
27	81	39	15.5	28.0
28	85	43	17.5	32.0
29	87	46	18.0	34.0
30	79	39	14.5	27.0
31	79	39	14.5	27.0
	AV	AV	Total	Total
	80.2	45.5	464.0	940.5

Sept	MAX	MIN	Base 50	Base 32
1	73	38	11.5	23.5
2	76	39	13.0	25.5
3	84	41	17.0	30.5
4	80	54	17.0	35.0
5	76	44	13.0	28.0
6	76	35	13.0	23.5
7	76	37	13.0	24.5
8	79	36	14.5	25.5
9	81	40	15.5	28.5
10	70	44	10.0	25.0
11	45	38	0.0	9.5
12	48	39	0.0	11.5
13	49	43	0.0	14.0
14	56	46	3.0	19.0
15	65	43	7.5	22.0
16	71	40	10.5	23.5
17	67	40	8.5	21.5
18	65	44	7.5	22.5
19	62	40	6.0	19.0
20	72	40	11.0	24.0
21	73	33	11.5	21.0
22	64	34	7.0	17.0
23	63	39	6.5	19.0
24	53	28	1.5	10.5
25	59	28	4.5	13.5
26	62	33	6.0	15.5
27	69	31	9.5	18.5
28	65	28	7.5	16.5
29	64	29	7.0	16.0
30	62	51	6.5	24.5
	AV	AV	Total	Total
	66.8	38.5	259.0	628.0

WEED AND SMALL GRAIN MANAGEMENT FOR WESTERN MONTANA

754

The Weed and Small Grain Management Project (754) includes research related to all types of weeds and small grains from seeding to data collection to publications.

Project Title: Evaluation of Affinity for Broadleaf Weed Control in Spring Wheat

Project Leader: Bob Stougaard

Project Personnel: Qingwu Xue

Objective: To evaluate efficacy and crop response of new soluble granule formulations (SG) versus the current water dispersible granule (WG) formulations.

Results:

WB 926 spring wheat was planted on April 19, 2005 at a seeding rate of 75 lb/ac, on 7" row spacings, to a depth of 1.5 inches. The site had abundant broadleaf weeds, mainly wild buckwheat, prostate knotweed and common lambsquarters. Treatments were applied using a backpack sprayer with Teejet XR11002 nozzles in 20 GPA of water, on May 13, 2005 when spring wheat plants were at the 3-leaf stage with 1 tiller and weeds were between the cotyledon and 2-leaf stage.

Crop injury was observed at 1-2 weeks after herbicide application, with the more severe injury occurring with higher rates. However, crop injury had diminished at 6 weeks after herbicide application. Affinity provided excellent control of the three major weeds regardless of formulations and rates.

Summary:

Affinity provided excellent broadleaf weed control in spring wheat. No differences were observed between the two formulations (SG and WG) in terms of herbicide efficacy and crop response.

Table 1. Effect of Affinity on crop injury and yield in spring wheat during 2005.

Trt no.	Treatment Name	Form Conc	Form Type	Rate oz/a	Crop injury (%) 5/20/05	Crop injury (%) 5/26/05	Crop injury (%) 6/27/05	Yield bu/ac
1	Harmony GT	50	SG	0.48	7.7	7.7	0	92.1
	Express	50	SG	0.12				
2	Harmony GT	75	WG	0.32	6	7.7	0	94.1
	Express	75	WG	0.08				
3	Harmony GT	50	SG	0.96	11	13.3	1.7	97.7
	Express	50	SG	0.24				
4	Harmony GT	75	WG	0.64	10.7	15	3.3	90.1
	Express	75	WG	0.16				
5	Harmony GT	50	SG	0.20	5	10	0	93.3
	Express	50	SG	0.20				
6	Harmony GT	75	WG	0.133	5.7	6.7	0	94.3
	Express	75	WG	0.133				
7	Harmony GT	50	SG	0.40	9.3	16.7	3.3	86.4
	Express	50	SG	0.40				
8	Harmony GT	75	WG	0.267	11	13.3	2.3	83.2
	Express	75	WG	0.267				
9	Harmony GT	50	SG	0.60	11.7	15	1.7	82.2
	Express	50	SG	0.30				
10	Harmony GT	75	WG	0.40	13.3	17.7	5	80.0
	Express	75	WG	0.20				
11	Harmony GT	50	SG	1.20	17.3	21.7	8	85.4
	Express	50	SG	0.60				
12	Harmony GT	75	WG	0.80	17.3	26.7	5.7	92.5
	Express	75	WG	0.40				
13	Check				0	0	0	87.2
LSD (P=.05)					3.06	4.89	4.23	11.96
CV					18.76	22.01	105.32	7.97
Treatment F					21.81	17.23	3.19	1.76
Treatment Prob(F)					0.0001	0.0001	0.0076	0.12

Table 2. Effect of Affinity on weed control in spring wheat during 2005.

Trt No.	Treatment Name	Form Conc	Form Type	Rate oz/a	Weed control (%)								
					Wild buckwheat			Prostate knotweed			Common lambsquarters		
					6/4/05	6/27/05	7/27/05	6/4/05	6/27/05	7/27/05	6/4/05	6/27/05	7/27/05
1	Harmony GT	50	SG	0.48	100	100	100	97.7	99.7	99.3	99.3	99.7	100
	Express	50	SG	0.12									
2	Harmony GT	75	WG	0.32	100	99.3	100	97	98.3	100	100	100	100
	Express	75	WG	0.08									
3	Harmony GT	50	SG	0.96	100	100	100	98.3	99.3	100	100	100	100
	Express	50	SG	0.24									
4	Harmony GT	75	WG	0.64	100	100	100	98.7	99	99.3	100	100	100
	Express	75	WG	0.16									
5	Harmony GT	50	SG	0.20	100	99.7	100	97	98.7	99.3	100	100	100
	Express	50	SG	0.20									
6	Harmony GT	75	WG	0.133	100	100	100	98	99.7	100	100	99.7	100
	Express	75	WG	0.133									
7	Harmony GT	50	SG	0.40	100	99.3	98.7	97.3	99.7	99.3	99.3	99.3	100
	Express	50	SG	0.40									
8	Harmony GT	75	WG	0.267	100	100	100	99.3	100	99.7	100	100	100
	Express	75	WG	0.267									
9	Harmony GT	50	SG	0.60	100	99.3	99.3	97.3	99.7	99.3	100	100	100
	Express	50	SG	0.30									

(Continued on next page)

Table 2 (continued). Effect of Affinity on weed control in spring wheat during 2005.

Trt	Treatment	Form	Form	Rate	Weed control (%)								
No.	Name	Conc	Type	oz/a	Wild buckwheat			Prostate knotweed			Common lambsquarters		
					6/4/05	6/27/05	7/27/05	6/4/05	6/27/05	7/27/05	6/4/05	6/27/05	7/27/05
10	Harmony GT	75	WG	0.40	100	100	100	99.3	99.7	99.3	100	100	100
	Express	75	WG	0.20									
11	Harmony GT	50	SG	1.20	100	100	100	98.7	100	100	100	100	100
	Express	50	SG	0.60									
12	Harmony GT	75	WG	0.80	100	100	100	99	100	100	100	100	100
	Express	75	WG	0.40									
13	Check				0	0	0	0	0	0	0	0	0
LSD (P=.05)					0	0.85	0.79	1.64	0.89	1.36	0.73	0.66	0
CV (%)					0	0.55	0.51	1.07	0.57	0.88	0.47	0.42	0
Treatment F					0	8966	10352	2356	8223	3504	12246	15178	0
Treatment Prob(F)					1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1

Project Title: Evaluation of Affinity for Broadleaf Weed Control in Spring Wheat

Project Leader: Bob Stougaard

Project Personnel: Qingwu Xue

Objective: To evaluate efficacy and crop response of new soluble granule formulations (SG) in spring wheat

Results:

WB 926 spring wheat was planted on April 19, 2005 at a seeding rate of 75 lb/ac, in 7" row spacing, to a depth of 1.5 inches. The site had abundant broadleaf weeds, principally wild buckwheat, prostate knotweed and common lambsquarters. Treatments were applied using a backpack sprayer with Teejet XR11002 nozzles in 20 GPA on May 13, 2005 when spring wheat plants were at the 3-leaf stage with 1 tiller and weeds were between the cotyledon and 2-leaf stage.

Crop injury was observed at 1-2 weeks after herbicide application, with the more severe injury occurring with higher rates. However, crop injury had diminished at 6 weeks after herbicide application. Affinity generally provided excellent control for the three major weeds. However, the efficacy varied with rate for buckwheat and knotweed control. The lower rates (trts 3 and 5) afforded less complete control (92-95%) than the higher rates (>96%).

Summary:

Affinity generally provided excellent broadleaf weed control in spring wheat.

Table 1. Effect of Affinity on crop injury and yield in spring wheat during 2005.

Trt No.	Treatment name	Form Conc	Form Type	Rate (oz/a)	Crop injury (%) 5/20/05	Crop injury (%) 5/27/05	Crop injury (%) 6/27/05	Yield (bu/ac)
1	Harmony GT	50	SG	0.480	7.3	13.3	0	67.5
	Express	50	SG	0.120				
2	Harmony GT	50	SG	0.800	10	18.3	0	62.2
	Express	50	SG	0.200				
3	Harmony GT	50	SG	0.200	4.7	13.3	0	68.4
	Express	50	SG	0.200				
4	Harmony GT	50	SG	0.400	9	18.3	0	69.0
	Express	50	SG	0.400				
5	Harmony GT	50	SG	0.333	6.3	16.7	0	65.3
	Express	50	SG	0.166				
6	Harmony GT	50	SG	0.600	13.3	25	1.7	59.6
	Express	50	SG	0.300				
7	Check				0	0	0	56.9
LSD (P=0.05)					3.17	5.77	NS	6.97
CV (%)					24.59	21.62	458	6.11
Treatment F					17.01	16.91	1	4.25
Treatment Prob(F)					0.0001	0.0001	0.4682	0.0159

Table 2. Effect of Affinity on broadleaf weed control in spring wheat during 2005.

Trt No.	Treatment name	Form Conc	Form Type	Rate (oz/a)	Weed control (%)								
					Wild buckwheat			Prostrate knotweed			Common lambsquarters		
					6/4/05	6/27/05	7/27/05	6/4/05	6/27/05	7/27/05	6/4/05	6/27/05	7/27/05
1	Harmony GT	50	SG	0.480	98.3	98.7	96	97	100	99.3	100	100	100
	Express	50	SG	0.120									
2	Harmony GT	50	SG	0.800	99.3	99.3	99.3	98	100	98.7	100	100	100
	Express	50	SG	0.200									
3	Harmony GT	50	SG	0.200	97.7	92.7	91.7	98	99.3	94	100	100	100
	Express	50	SG	0.200									
4	Harmony GT	50	SG	0.400	99.7	97.7	97	99	100	100	100	100	100
	Express	50	SG	0.400									
5	Harmony GT	50	SG	0.333	98.3	96.7	95	98.3	100	95	100	100	100
	Express	50	SG	0.166									
6	Harmony GT	50	SG	0.600	98.3	98.3	96.7	98	100	96	100	100	100
	Express	50	SG	0.300									
7	Check				0	0	0	0	0	0	0	0	0
LSD (P=.05)					1.97	4.00	8.36	1.60	0.78	6.79	0	0	0
CV (%)					1.31	2.70	5.71	1.07	0.51	4.58	0	0	0
Treatment F					3389	803	180	5092	22451	279	0	0	0
Treatment Prob(F)					0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1	1	1

Project Title: Carryover Effect of Auxinic Herbicides on Peppermint

Project Leader: Bob Stougaard

Project Personnel: Qingwu Xue and Fernando Guillen

Objective: To evaluate the mint injury one year after application of auxinic herbicides at different rates.

Results:

A field study was conducted in 2004 in an established field of Black Mitchum peppermint, planted in the fall of 2000. The field was sprayed with Goal 2XL on March 31, 2004 as a dormant treatment. The treatments included 3 rates of Banvel, Tordon, Garlon, Stinger, Starane, and an untreated check. These 5 herbicides were applied at 0.125, 0.25, and 0.5 lb ai/A on May 6, 2004 when mint was 3 inches tall. The treatments were applied using a CO_2 backpack sprayer in 20 GPA of water with XR11002 nozzles.

One year after herbicides application, carryover injury with the highest rate of Tordon was still observed. No crop injury was found with the lower rates of Tordon or with any of the other herbicides. Regarding mint biomass yield, the high rate of Tordon (0.5 lb ai/a) was the only treatment to reduce yields. All other treatments produced yields similar to the untreated control.

Summary:

Carryover effects were only observed with the high rate of Tordon.

Table 1. Carryover effects of Banvel, Tordon, Garlon, Stinger and Starane on peppermint.

Trt No.	Treatment Name	Rate lb ai/a	Crop Injury % 7/6/05	Biomass yield ton/ac 8/8/05
1	Banvel SGF	0.125	0.0	2.7
2	Banvel SGF	0.250	0.0	3.0
3	Banvel SGF	0.500	0.0	3.1
4	Tordon 22K	0.125	0.0	2.7
5	Tordon 22K	0.250	11.7	3.0
6	Tordon 22K	0.500	50.0	2.3
7	Garlon	0.125	0.0	2.9
8	Garlon	0.250	0.0	3.0
9	Garlon	0.500	0.0	2.9
10	Stinger	0.125	0.0	3.0
11	Stinger	0.250	0.0	2.6
12	Stinger	0.500	0.0	2.8
13	Starane	0.125	0.7	2.7
14	Starane	0.250	0.0	3.0
15	Starane	0.500	0.0	2.8
16	Untreated		0.0	2.7
LSD (P=0.05)			4.33	0.42
CV (%)			66.65	8.98
Treatment F			71.00	1.89
Treatment Prob(F)			0.0001	0.069

Project Title: Evaluation of BAS 777 Herbicide for Wild Oat Control in Clearfield Spring Wheat

Project Leader: Bob Stougaard

Project Personnel: Qingwu Xue

Objective: To evaluate crop response and efficacy of BAS 777 for wild oat control in Clearfield spring wheat

Results:

BAS 777 herbicide (a combination of Beyond and MCPA) was evaluated for wild oat control. A herbicide resistant (Clearfield) spring wheat cultivar was planted to a depth of 1.5 inches on April 16, 2005 at 65 lb/ac using a double disk drill with 6" row spacing. Wild oat seeds were planted in the center of each plot at a density of 16 plants/ft^2. Herbicide treatments included BAS 777 alone or mixed with Clarity. Beyond, and other standard wild oat herbicides (Discover, Puma and Everest) were also included. The treatments were applied on May 18, 2005 using a backpack sprayer with Teejet XR11002 nozzles at 20 GPA. The environmental conditions were ideal at application (clear sky, no wind, and 58 F of soil temperature). Spring wheat plants were at 4-leaf stage with 2 tillers and wild oats were at 3-leaf stage with 1-2 tillers when the herbicides were applied.

Crop injury by BAS 777 alone or mixed with Clarity was observed at 2 weeks after application, but diminished by 8 weeks after application. Everest also resulted in some initial crop injury. All herbicide treatments provided 100% wild oat control except Puma (97%). BAS777 applied alone or mixed with Clarity, provided excellent wild oat control.

Summary:

The Clearfield cultivar had excellent tolerance to BAS 777. The combination of Beyond and MCPA appeared not to result in antagonism for wild oat control.

Table 1. Effect of BAS 777 on crop injury, wild oat control and yield in Clearfield spring wheat.

Trt No.	Treatment Name	Rate (lb ai/a)	Crop injury (%) 5/31/05	Crop injury (%) 6/9/05	Crop injury (%) 6/15/05	Crop injury (%) 7/13/05	Wild oat control (%) 5/31/05	Wild oat control (%) 6/9/05	Wild oat control (%) 6/15/05	Wild oat control (%) 7/13/05	Yield bu/ac
1	Check		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.9
2	Beyond	0.0312	0.0	0.0	0.0	0.0	76.7	90.0	90.0	100.0	52.3
3	BAS 777	0.2800	6.7	1.7	0.0	3.3	71.7	91.7	93.3	100.0	50.7
4	BAS 777	0.2800	10.0	3.3	1.7	1.7	63.3	88.3	90.0	100.0	54.3
4	Clarity	0.1250									
5	Discover	0.0625	1.7	1.7	0.0	0.0	90.0	93.3	95.0	100.0	50.0
6	Puma	0.0800	5.0	1.7	1.7	1.7	78.3	90.0	91.7	96.7	45.8
7	Everest	0.0268	6.7	5.0	3.3	5.0	53.3	81.7	88.3	100.0	47.3
LSD (P=0.05)			5.14	3.88	3.27	5.07	8.04	3.96	3.54	1.94	6.15
CV (%)			67.36	115	193	171	7.30	2.91	2.54	1.28	7.31
Treatment F			5.29	2.00	1.53	1.37	129	695	906	3564	21.82
Treatment Prob(F)			0.007	0.14	0.25	0.30	0.0001	0.0001	0.0001	0.0001	0.0001

Project Title: Evaluation of Wild Oat Herbicides in Spring Wheat

Project Leaders: Bob Stougaard

Project Personnel: Qingwu Xue and Fernando Guillen

Objective: To evaluate reduced rate wild oat herbicide performance in spring wheat

Results:

Seven wild oat herbicides were applied at two application rates (label, 1X and half-label, 1/2X) to evaluate the consistency of wild oat control in spring wheat. Scholar spring wheat was planted on April 27, 2005 at a seeding rate of 75 lb/ac, in 7 inch row spacing, to a depth of 1.5 inches. Wild oat was planted within each plot at a density of 16 plants per square foot. Herbicides were applied on May 23, 2005 using a backpack sprayer with Teejet XR11002 nozzles in 20 GPA. Spring wheat and wild oat plants were at the 3-4-leaf stage with 0-2 tillers (1-2 for wheat and 0-2 for wild oat) and were 2-3" tall at the time of application.

Crop injury was minimal for most of the herbicides except Silverado, which resulted in 10% crop injury at 1 week after application. However, crop injury with Silverado declined as the season progressed. At label rates (1X), all the herbicides provided excellent wild oat control (91-100%). However, wild oat control varied among herbicides when applied at the half-label rate (1/2X), with Puma providing the poorest control. Wild oat competition significantly reduced yield (36%) and decreased grain test weight (3%). However, herbicide rate did not affect yield or test weight.

Summary:

Crop injury was minimal regardless of the rate applied. All herbicides provided excellent wild oat control at the 1X rate. However, wild oat control was reduced at 1/2X rate, especially with Puma. Although the 1/2X rate generally resulted in yields comparable to that obtained with the 1X rate, the 1/2X rate resulted on more wild oat biomass, and consequently, greater wild oat seed production.

Future Plans:

Continue to evaluate new and existing wild oat herbicides for efficacy and crop tolerance.

Table 1. Reduced rate herbicide effects on crop injury and wild oat control in spring wheat.

Treatment	Label rate (1X, lb ai/a)	Crop injury (%)						Wild oat control (%)							
		5/31/05		6/9/05		6/20/05		5/31/05		6/9/05		6/20/05		7/27/05	
		1X	1/2X	1X	1/2X	1X	1/2X	1X	1/2X	1X	1/2X	1X	1/2X	1X	1/2X
Achieve	0.1800	1.7	1.7	1.7	0.0	0.0	0.0	56.7	51.7	83.3	85.0	96.7	96.7	100.0	100.0
Pinoxaden	0.0540	0.0	1.7	0.0	0.0	3.3	0.0	78.3	63.3	90.0	86.7	100.0	99.3	100.0	96.7
Everest	0.0262	3.3	1.7	0.0	0.0	8.3	3.3	50.0	50.0	75.0	73.3	100.0	93.3	97.0	96.7
Silverado	0.0028	10.0	10.0	8.3	3.3	3.3	5.0	78.3	71.7	86.7	76.7	91.7	82.7	100.0	92.3
Hoelon	1.0000	1.7	0.0	0.0	0.0	0.0	3.3	70.0	65.0	85.0	85.0	88.3	86.0	94.7	89.3
Puma	0.0830	0.0	0.0	0.0	0.0	0.0	0.0	70.0	60.0	88.3	80.0	100.0	45.0	91.3	61.7
Discover	0.0500	0.0	0.0	0.0	0.0	3.3	3.3	70.0	53.3	81.7	75.0	96.7	99.3	99.3	84.3
Control		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LSD (0.05)	Herbicide (A)	1.5		1.3		NS		9.1		4.8		8.1		4.7	
	Rate (B)	NS		0.7		NS		4.6		2.4		4.0		2.3	
	AxB	NS		1.8		NS		NS		NS		11.4		6.6	

NS: Not significant (P>0.05).

Table 2. Reduced rate herbicide effects on wild oat biomass, spring wheat yield and grain quality.

Treatment	Label rate (1X, lb ai/a)	Wild oat biomass (g/m^2) 7/25/05		Yield (bu/ac)		Test weight (lb/bu)		Dockage (%)	
		1X	1/2X	1X	1/2X	1X	1/2X	1X	1/2X
Achieve	0.1800	0.0	12.2	52.4	52.3	60.6	61.3	1.6	1.0
Pinoxaden	0.0540	0.0	0.0	49.5	46.0	61.3	61.3	1.2	1.2
Everest	0.0262	16.6	23.6	46.0	47.1	61.4	61.3	0.9	1.0
Silverado	0.0028	13.6	82.5	49.1	50.8	61.4	61.2	1.1	1.2
Hoelon	1.0000	19.5	59.5	50.1	46.8	61.8	61.5	1.0	1.1
Puma	0.0830	3.8	207.2	49.3	47.4	61.5	61.1	0.8	1.8
Discover	0.0500	18.3	55.7	52.1	51.0	61.4	61.1	0.6	1.0
Control		430.7	581.9	31.2	31.4	59.4	59.6	6.1	6.2
LSD (0.05)	Herbicide (A)	41.0		4.5		0.4		0.5	
	Rate (B)	20.5		NS		NS		NS	
	AxB	58.0		NS		NS		NS	

Project Title: Effect of Plant Growth Regulators (PGRs) on Spring Wheat Stem Solidness and Agronomic Performance

Project Leaders: Bob Stougaard

Project Personnel: Qingwu Xue and Fernando Guillen

Objective: To evaluate PGR effects on spring wheat stem solidness

Results:

Two PGRs (Cerone and Palisade) and one fungicide (Headline) were evaluated for their effects on spring wheat stem solidness and agronomic performance. Scholar spring wheat was planted on April 27, 2005 at a seeding rate of 75 lb/ac, in 7 inch row spacing, to a depth of 1.5 inches. The treatments were applied at different rates and growth stages (second node and early boot), using a backpack sprayer with Teejet XR11002 nozzles and 20 GPA. The application dates were June 15 (second node) and June 21, 2005 (boot).

In general, Cerone did not affect spring wheat stem solidness regardless of application rate and timing. Headline improved stem solidness when applied at the second node stage, but not at the later application timing. Palisade increased stem solidness in all internodes. Palisade rate had little effect on stem solidness. Application of Cerone and Headline did not affect heading date. Palisade application delayed heading date and the delay increased as rate increased. Headline application did not affect plant height, and Cerone reduced height slightly. However, plant height was reduced when Palisade was applied at second node and booting. In general, Cerone and Palisade did not affect yield. However, the high rate of Palisade reduced yield when applied at boot. Headline improved yield when applied at the second node stage.

Summary:

Application of Palisade at second node and booting increased stem solidness. However, Palisade at higher rate reduced spring wheat yield. Headline increased pith development and yield when applied at the second node stage.

Table 1. Effects of PGRs (Cerone and Palisade) and fungicide Headline on spring wheat stem solidness and agronomic performance in 2005.

Treatment name	Rate	Appl. Code	Stem solidness						heading	Height	Yield
			Internodes					Total			
	lb ai/a		1	2	3	4	5		Julian	cm	bu/ac
Cerone	0.12	B	2.5	2.7	2.9	3.0	2.7	13.7	179.7	91.0	53.4
Cerone	0.25	B	3.0	2.6	2.6	3.5	3.4	14.9	180.0	88.7	53.9
Cerone	0.37	B	2.7	3.2	2.8	3.4	3.7	15.9	180.0	86.3	53.1
Palisade	0.12	B	3.2	2.9	3.1	3.7	4.5	17.4	180.0	82.3	52.5
Palisade	0.25	B	3.8	3.1	3.5	4.2	4.9	19.5	181.3	61.7	52.3
Palisade	0.37	B	4.2	3.4	3.8	4.3	5.0	20.6	182.7	55.7	49.9
Cerone	0.12	C	2.9	2.7	3.0	3.5	3.0	15.1	179.7	90.7	58.4
Cerone	0.25	C	3.2	3.1	3.1	3.5	3.3	15.9	180.0	82.0	53.9
Cerone	0.37	C	3.2	2.6	2.8	3.4	3.3	15.3	180.0	79.7	55.5
Palisade	0.12	C	3.5	2.9	3.0	4.2	4.7	18.4	182.3	54.3	49.9
Palisade	0.25	C	4.3	3.3	3.2	3.9	4.7	19.5	183.3	47.7	42.6
Palisade	0.37	C	4.6	3.7	3.3	3.9	4.5	20.0	184.3	45.3	42.0
Headline	0.147	B	3.7	3.1	3.4	3.7	3.9	17.9	179.7	96.7	65.0
Headline	0.147	C	3.3	2.7	3.0	3.7	3.3	15.9	179.7	89.7	51.0
Untreated			3.0	2.6	2.6	3.2	2.9	14.3	179.7	95.3	51.2
LSD (0.05)			0.91	0.52	0.67	0.69	0.82	2.51	0.95	8.02	8.68
CV (%)			16.21	10.48	12.95	11.26	13.11	8.94	0.32	5.95	9.90
Treatment F			3.58	3.77	2.04	2.66	9.34	7.17	17.59	38.51	2.77
Treatment Prob (F)			0.0011	0.0007	0.0427	0.009	0.0001	0.0001	0.0001	0.0001	0.0034

A: Jointing; B: Second node; C: Booting.

Project Title:	Evaluation of Everest Herbicide for Wild Oat Control in Spring Wheat
Project Leader:	Bob Stougaard
Project Personnel:	Qingwu Xue
Objective:	To evaluate crop response and efficacy of Everest herbicide in spring wheat

Results:

Everest was evaluated for wild oat control when applied at different rates and tankmix partners in spring wheat. Scholar spring wheat was planted on April 27, 2005 with seeding rate of 75 lb/ac, 7" row spacing, and 1.5" seeding depth. Wild oat was planted perpendicularly after planting spring wheat with a density of 16 plants per square foot. Herbicides were applied on May 18, 2005 using a backpack sprayer with Teejet XR11002 nozzles and 20 GPA. Spring wheat and wild oat plants were at 3-4-leaf stage with 0-2 tillers (1-2 for wheat and 0-2 for wild oat) and 2-3" tall when herbicides were applied.

Either applied alone or mixed with other herbicides, Everest provided excellent wild oat control (>97%). Although Discover, Puma and Silverado also had good wild oat control, the efficacy of these herbicides was lower than that of Everest. In general, crop injury was minimal for all the treatments in this trial.

Summary:

Either applied alone or mixed with other herbicides, Everest provided excellent wild oat control. Also, crop injury was minimal after Everest application.

Table 1. Everest herbicide effect on crop injury, wild oat control and yield in spring wheat.

Trt	Treatment	Rate	Crop injury (%)				Wild oat control (%)					Yield
No.	Name	(lb ai/a)	5/31/05	6/9/05	6/15/05	7/13/05	5/31/05	6/9/05	6/15/05	7/13/05	7/27/05	bu/ac
1	Check		0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	44.6
2	Everest	0.0175	0.0	0.0	0.0	0.0	53.3	85.0	94.3	100.0	97.0	53.6
3	Everest	0.0219	0.0	1.7	0.0	0.0	53.3	90.0	94.3	100.0	99.3	54.6
4	Everest	0.0262	0.0	1.7	1.7	0.0	53.3	88.3	97.0	100.0	99.0	62.7
5	Everest Bronate Adv.	0.0175 0.5000	0.0	1.7	3.3	0.0	56.7	86.7	92.7	100.0	98.3	58.0
6	Everest Bronate Adv.	0.0262 0.5000	0.0	0.0	0.0	3.3	60.0	83.3	95.0	100.0	99.0	51.7
7	Discover NG	0.0500	1.7	0.0	0.0	0.0	86.7	93.3	98.0	95.0	92.0	59.6
8	Discover NG Bronate Adv	0.0500 0.5000	0.0	0.0	0.0	0.0	86.7	95.3	97.0	97.7	93.7	60.2
9	Puma	0.0825	1.7	0.0	0.0	0.0	88.3	90.0	93.3	98.3	92.0	58.5
10	Puma Bronate Adv.	0.0825 0.5000	0.0	0.0	0.0	0.0	81.7	88.3	95.3	98.3	93.7	54.9
11	Silverado	0.0022	1.7	0.0	3.3	0.0	73.3	85.0	90.0	100.0	92.3	56.5

Continued on next page.

Table 1 (Continued). Everest herbicide effect on crop injury, wild oat control and yield in spring wheat.

Trt No.	Treatment Name	Rate (lb a/a)	Crop injury (%) 5/31/05	6/9/05	6/15/05	7/13/05	Wild oat control (%) 5/31/05	6/9/05	6/15/05	7/13/05	7/27/05	Yield bu/ac
12	Silverado Bronate Adv.	0.0022 0.5000	3.3	3.3	4.0	1.7	75.0	83.3	91.7	98.3	93.0	52.9
13	Everest Puma	0.0175 0.0078	0.0	0.0	0.0	0.0	60.0	86.7	91.7	100.0	98.3	56.7
14	Everest Puma	0.0175 0.0078	0.0	1.7	1.7	0.0	48.3	88.3	91.0	100.0	99.0	60.1
LSD (P=.05)			2.51	3.59	4.09	1.80	10.79	5.96	5.94	3.46	6.74	11.15
CV (%)			251.64	299.57	243.67	299.57	10.25	4.35	4.06	2.24	4.51	11.85
Treatment F			1.49	0.76	1.16	2.44	37.26	134.33	152.34	496.90	123.74	1.42
Treatment Prob(F)			0.19	0.69	0.36	0.03	0.0001	0.0001	0.0001	0.0001	0.0001	0.22

Project Title: Headline efficacy in Barley

Project Leader: Bob Stougaard

Project Personnel: Qingwu Xue

Objective: To evaluate Headline fungicide on barley yield and agronomic performance

Results:

Headline is a member of the Strobilurin fungicide class. In addition to foliar disease control, evidence suggests that Headline may improve yield under non-disease conditions. In this study, Headline was evaluated at 2 rates and 2 application timings in barley. Barley (cv Baronesse) was planted on April 16, 2005 at seeding rate of 75 lb/ac, 6" row spacing and 1.5" deep. The field was fertilized with 80-28-120-24 lb/ac of N-P-K-S before planting. There were five treatments (four fungicide treatments and an untreated check). Two treatments were applied at jointing, one treatment was applied at flag-leaf emergence, and the final treatment consisted of applications at jointing plus flag-leaf emergence. Treatments were applied on May 31, 2005 (jointing) and June 13, 2005 (flag-leaf), using a backpack sprayer with Teejet XR11002 nozzles and 20 GPA.

Although precipitation was high before grain filling, leaf disease was minimal for barley in this season. In general, there were no significant differences in yield and other agronomic data among treatments. However, there was a strong trend that the higher rate (0.098 lb ai/a), particularly at flag-leaf stage, increased yield, test weight, plumpness and thousand kernel weight (TKW).

Summary:

Although application of Headline had little effect on yield and grain quality in this season, higher rate at flag-leaf stage appeared beneficial to barley yield and grain quality.

Table 1. Headline fungicide effect on barley yield and grain quality.

Trt No.	Treatment Name	Rate	Appl code	Yield	Grain moisture	Test weight	Plump	TKW
		lb ai/a		bu/ac	%	lb/bu	%	g
1	Headline	0.049	A	125.7	12.3	50.5	69.4	39.4
2	Headline	0.098	A	138.3	12.4	51.8	78.1	42.5
3	Headline Headline	0.049 0.049	A B	140.7	13.3	52.3	86.1	44.8
4	Headline	0.098	B	139.6	12.5	52.3	85.9	44.0
5	Untreated			133.7	12.3	52.0	82.2	43.6
LSD (P=0.05)				13.40	1.01	1.87	14.81	3.05
CV (%)				6.41	5.23	2.35	11.97	4.62
Treatment F				1.99	1.66	1.46	2.08	4.48
Treatment Prob(F)				0.16	0.22	0.28	0.15	0.02

A: Jointing; B: Flag-leaf emergence.

Project Title: Knapweed Control with Telar

Project Leaders: Bob Stougaard

Project Personnel: Qingwu Xue and Fernando Guillen

Objective: To evaluate knapweed control using herbicides

Results:

This study was conducted in native grassland (Canadian bluegrass, bulbous bluegrass and bromegrass) with abundant spotted knapweed. Herbicide treatments included different application rates of Telar either alone or mixed with Tordon and Transline. The herbicides were applied on September 22, 2004 when knapweed was at the rosette stage, using a backpack sprayer with Teejet XR11002 nozzles and 20 GPA.

Telar applied alone did not provide any knapweed control. However, knapweed control was 100% when Telar was mixed with Tordon and Transline.

Table 1. Application of Telar alone and mixed with Tordon and Transline on knapweed control.

Trt No.	Treatment Name	Rate oz a/a	Weed control (%) 5/26/05	8/4/05
1	Telar	0.50	0	0
2	Telar	0.75	0	0
3	Telar	1.00	0	0
4	Telar	1.50	0	0
5	Telar Tordon 22K	0.75 4.00	100	100
6	Telar Transline	0.75 4.00	100	100
7	Untreated		0	0

Project Title: Effect of Auxinic Herbicides on Peppermint

Project Leader: Bob Stougaard

Project Personnel: Qingwu Xue and Fernando Guillen

Objective: To evaluate the mint tolerance to auxinic herbicides at different application rates.

Results:

This is the second year's study for evaluating mint tolerance to different auxinic herbicides in an established field of Black Mitchum peppermint, planted in the fall of 2000. The treatments included 3 application rates of Banvel, Tordon, Garlon, Stinger and Starane, and an untreated check. These 5 herbicides were applied at 0.125, 0.25, and 0.5 lb ai/a on May 20, 2005 when mint was 3-7 inches tall. The treatments were applied using a CO_2 backpack sprayer in 20 GPA of water using XR11002 nozzles. The treatment with the low rate of Garlon (0.125 lb ai/a) was discarded due to an application error in this season.

Crop injury was evaluated as plant stunting and discoloration. Stunting occurred in all treatments and increased as herbicide rate increased. However, the effect was transitory and decreased as growing season progressed. Comparing among herbicides, Banvel, Tordon and Garlon resulted in more stunting than Starane and Stinger. The high rate of Banvel, Tordon and Garlon (0.5 lb ai/a) exhibited the greatest stunting. Discoloration occurred in treatments with higher rate of Banvel, Tordon, Garlon and Starane. In contrast to stunting, discoloration in treatments with Banvel and Tordon increased as growing season progressed.

Except for the high rates of Banvel, Tordon and Garlon (0.5 lb ai/a), mint biomass yield was not affected by herbicide. The high rate of Banvel, Tordon and Garlon decreased biomass yield about 20%. The herbicide effect on mint oil yield was less consistent as compared to biomass.

Summary:

The results of this years study are consistent with those from last year, indicating that low rates of Tordon, Garlon and Starane have potential for use in mint for weed control.

Table 1. Effects of Banvel, Tordon, Garlon, Stinger and Starane on mint injury, yield and oil content in 2005.

Trt No.	Treatment Name	Rate (lb ai/a)	Crop injury (%)						Biomass ton/ac	Oil yield lb/ac
			Stunt			Discoloration				
			6/9/05	6/15/05	7/6/05	6/9/05	6/15/05	7/6/05		
1	Banvel SGF	0.125	8.3	25.0	16.0	0.0	6.7	11.7	3.1	59.4
2	Banvel SGF	0.250	13.3	25.0	31.7	3.3	3.3	15.0	3.0	68.5
3	Banvel SGF	0.500	16.7	36.7	41.7	5.0	5.0	20.0	2.4	45.9
4	Tordon 22K	0.125	5.0	11.7	6.7	1.7	1.7	6.7	3.1	58.8
5	Tordon 22K	0.250	18.3	30.0	18.3	6.7	15.0	10.0	2.9	73.0
6	Tordon 22K	0.500	31.7	46.7	41.7	8.3	20.0	15.0	2.4	52.7
8	Garlon	0.250	15.0	36.7	6.7	5.0	8.3	0.0	3.2	56.4
9	Garlon	0.500	28.3	58.3	31.7	1.7	13.3	0.0	2.3	71.4
10	Stinger	0.125	0.0	0.0	0.0	0.0	0.0	0.0	3.4	64.0
11	Stinger	0.250	3.3	1.7	0.0	0.0	0.0	0.0	2.9	53.9
12	Stinger	0.500	6.7	5.0	0.0	0.0	0.0	5.0	3.3	65.4
13	Starane	0.125	6.7	6.7	0.0	0.0	0.0	0.0	2.9	42.2
14	Starane	0.250	21.7	25.0	3.3	3.3	1.7	0.0	2.7	59.5
15	Starane	0.500	40.0	53.3	10.0	16.7	10.0	0.0	2.6	64.8
16	Untreated		0.0	0.0	0.0	6.7	0.0	0.0	2.9	47.2
LSD (P=0.05)			7.32	11.97	13.52	7.27	5.06	4.46	0.49	20.42
CV (%)			30.54	29.70	58.40	111.76	53.43	47.97	10.29	20.70
Treatment F			22.41	22.47	11.13	3.26	13.48	20.89	3.79	1.74
Treatment Prob(F)			0.0001	0.0001	0.0001	0.0038	0.0001	0.0001	0.0013	0.1051

Project Title: Effect of Plant Growth Regulators (PGR's) on Spring Wheat Stem Solidness and Agronomic Performance

Project Leaders: Bob Stougaard

Project Personnel: Qingwu Xue and Fernando Guillen

Objective: To evaluate PGR effects on spring wheat stem solidness

Results:

Six PGR's were evaluated for their effects on spring wheat stem solidness and agronomic performance. Scholar spring wheat was planted on April 27, 2005 at a seeding rate of 75 lb/ac, in 7 inch row spacing, to a depth of 1.5 inches. Treatments were applied at early booting (June 21, 2005), using a back pack sprayer with Teejet XR11002 nozzles and 20 GPA.

In general, the treatments did not affect stem solidness in the lower internodes (1-4). However, there was a significant difference in stem solidness among treatments for internode five. This response is not surprising since the treatments were applied at the boot stage. Apogee improved stem solidness to the greatest extent, followed by Palisade, Cycocel, and Trimmit, respectively. Tilt essentially had no effect on pith development. Interestingly, Cerone tended to reduce stem solidness. Overall, Apogee appears to be the most viable compound for the improvement of pith development in wheat.

Summary:

Several PGR's increased stem solidness in the fifth internode. Such materials could be useful in the management of the wheat stem sawfly.

Future Plans:

Evaluate the effects of PGR rates and application timing on stem solidness.

Table 1. Effects of PGRs on spring wheat stem solidness and agronomic performance in 2005.

PGR	Rate	Stem solidness						Heading	Plant height	Yield	Grain moisture	Test weight	TKW
		Internodes					Total						
	(lb ai/a)	1	2	3	4	5		Julian	cm	bu/ac	%	lb/bu	g
Cerone	0.375	3.2	2.5	2.4	2.4	1.9	12.4	180.3	98.7	74.1	10.9	61.0	33.4
Palisade	0.375	3.5	3.1	3.1	2.6	3.8	16.1	184.7	56.0	56.3	10.5	60.4	31.1
Apogee	0.137	3.5	2.8	2.7	2.9	4.5	16.3	182.3	68.3	74.3	10.9	60.6	36.2
Cycocel	0.500	3.0	2.5	2.4	2.2	3.4	13.6	180.0	86.0	76.4	10.7	60.8	34.1
Trimmit	0.250	3.3	2.7	2.8	2.7	3.3	14.4	179.3	93.0	86.3	11.2	61.7	37.1
Tilt	0.112	2.8	2.5	2.3	2.9	2.3	12.7	179.7	101.0	85.9	11.4	62.2	37.4
Untreated		2.9	2.7	2.5	2.7	2.2	12.9	179.7	106.7	78.2	11.0	61.4	34.6
LSD (0.05)		NS	NS	NS	NS	1.04	2.27	0.99	7.21	11.17	NS	1.16	2.54
CV (%)		11.40	12.01	14.87	18.19	19.24	9.07	0.31	4.66	8.27	4.15	1.07	4.11

NS: Not significant (P>0.05).

Project Title: Effect of Spring Wheat Seed Size on Stem Solidness

Project Leaders: Bob Stougaard

Project Personnel: Qingwu Xue and Fernando Guillen

Objective: To evaluate the effect seed size on stem solidness

Results:

Three spring wheat cultivars (Amidon, Explorer and Scholar) were graded into large and small seed size classes by passing seeds over 2.4 and 1.9 mm sieves. Large seed was that retained on the 2.4 mm sieve and small seed was that which passed through the 2.4 mm sieve but was retained on the 1.9 mm sieve. The spring wheat plots were planted on April 16, 2005 at a seeding rate of about 90 lb/ac, in 6 inches row spacing, to a depth of 2 inches.

Spring wheat seed size had no effect on stem solidness in all three cultivars in this study. However, there were differences in stem solidness at first and second internodes among cultivars, with Explorer having greater pith development than either Amidon or Scholar.

Summary:

Although there were differences in stem solidness among cultivars, seed size had no effect on the expression of this trait.

Table 1. Effect of spring wheat seed size on stem solidness in three cultivars.

Trt No.	Treatment Name	Internodes 1	2	3	4	5	total
1	Scholar-L	3.5	2.7	2.8	2.7	2.4	15.3
2	Scholar-S	3.7	2.6	2.7	2.6	2.4	15.5
3	Explorer-L	4.3	3.1	2.6	2.3	2.7	20.9
4	Explorer-S	4.3	3.0	2.8	2.5	2.5	16.1
5	Amidon-L	3.0	2.6	3.0	2.5	2.6	13.9
6	Amidon-S	3.2	2.5	2.8	2.7	2.6	14.4
LSD (0.05)		0.74	0.40	0.45	0.38	0.35	6.76
CV (%)		13.40	9.52	10.80	9.94	9.23	28.04
Treatment F		5.11	3.36	0.60	1.53	1.16	1.25
Treatment Prob(F)		0.01	0.03	0.70	0.24	0.37	0.34

L: large seed; S: small seed.

Project Title: Herbicide Injury Potential to Montana Wheat Varieties

Project Leaders: Bob Stougaard and Steve King

Project Personnel: Qingwu Xue and Fernando Guillen

Objective: To evaluate herbicide tolerance and the expression of stem solidness among genetically diverse spring wheats

Results:

Two studies were conducted to evaluate spring wheat cultivar susceptibility to herbicides. In the first study, eight spring wheat cultivars (Reeder, McNeal, Choteau, Outlook, Hank, MTHW0202, MT0260, and MT0245) were evaluated for their tolerance to the wild oat herbicides, Everest and Silverado. This study was conducted at Kalispell and Huntley. At Kalispell, the cultivars were planted in a wild oat-free area on April 16, 2005 at a seeding rate of 90 lb/ac, on 6 inch row spacings, to a depth of 2 inches. At Huntley, the cultivars were planted in a wild oat infested area on April 8, 2005. Everest (0.026 lb ai/a) and Silverado (0.0028 lb ai/a) were applied with CO_2 backpack sprayers in 20 GPA of water using XR11002 nozzles on May 6, 2005 at Huntley and May 11, 2005 at Kalispell. Wheat plants were at three leaf stage and about 4 inches when herbicides were applied. Non-treated controls were included for each cultivar.

At Kalispell, maximum crop injury was observed at 2 weeks after herbicide application, and ranged from 11 to 33% (Table 1). Injury was primarily observed in the form of plant height reduction. Height reductions were most severe for Silverado, but were also observed with Everest. The degree of crop injury varied and appeared to be greater for specific varieties. Using a 20% crop injury rating as a benchmark, both Everest and Silverado initially caused greater than 20% injury in Choteau, Hank, McNeal and Outlook. While crop injury was noticeable early in the season, the extent of the symptoms decreased as the season progressed. Nonetheless, both herbicides reduced yields in some varieties when compared to the non-treated controls. Specifically, the yields of Reeder and MT0260 were decreased by both herbicides. However, Everest also tended to reduce the yields of Choteau, Outlook, MT0245, and MTHW0202. Neither herbicide appeared to affect test weight, thousand kernel weight, lodging, or the degree of stripe rust infection.

Injury was minimal at Huntley during the entire season (Table 2). This response underscores the impact that environment has on the degree of herbicide injury. Nonetheless, Silverado tended to cause greater injury than Everest. The extent of this injury varied by variety, with Choteau having the greatest damage (12.5%). Since weeds were present in the non-treated control plots, the direct effect of herbicide damage on yield is not possible. Accordingly, yields were highest when the herbicides were applied. However, the extent of the yield increase was minimal with Reeder and indicates that Reeder was more sensitive to both herbicides.

While the first study evaluated the obvious effects of herbicide damage, the second study investigated the impact that herbicides might have on stem solidness. This second study was conducted at Kalispell and consisted of fifteen herbicide treatments. Scholar spring wheat was planted on April 27, 2005 at a seeding rate of 75 lb/ac, on 7 inch row spacing, and seeded to a depth of 2 inches. Four representative herbicides from the auxinic, ALS, and ACCase herbicide classes were applied at the 3 to 4 leaf stage. Additionally, an individual representative of each herbicide class was applied during the flag leaf stage. Herbicides were applied using a backpack sprayer with Teejet XR11002 nozzles in 20 GPA.

The individual effects of herbicides on stem solidness were only observed in the fifth internode. For the early applications, Ally, and to a lesser extent Express, tended to increase stem solidness the most (Table 3). This conclusion was further substantiated when the analysis considered herbicides grouped based on their mode of action (Table 4). Treatments consisting of the ALS herbicide group had the highest stem solidness rating. This was observed for the fourth as well as the fifth internode. Moreover, early applications of auxinic herbicides tended to result in lower stem solidness ratings for the fifth internode as compared to the ALS herbicide class. The late application of Discover also increased stem solidness.

Summary:

The extent of crop injury from wild oat herbicides varied by location, with herbicide damage being more apparent at Kalispell compared to Huntley. Crop injury also varied between the herbicides, and was generally more severe with Silverado as compared to Everest at both locations. Certain cultivars also appeared to have greater susceptibility to herbicide injury. This was most apparent at Kalispell, where both products injured Choteau, Hank, McNeal, and Outlook. Although crop injury was greatest with these varieties, yield reductions were observed with Reeder and MT0260. The yield of Reeder also appeared to be suppressed at Huntley.

Herbicide effects were also observed with stem solidness. Preliminary results indicate that the ALS herbicides may potentially increase stem solidness, while auxinic herbicide may decrease pith development.

Future Plans:

Repeat both studies to confirm these preliminary results.

Table 1. Crop injury and agronomic data in spring wheat cultivars as influenced by Everest and Silverado herbicides at Kalispell, MT during 2005.

Cultivar	Treatment	Plant height (cm)			Crop injury (%)		Yield	Test weight	Grain moisture	TKW	Heading	Lodging	Stripe rust 7/8/05	Protein
		5/24/05	6/9/05	7/22/05	5/26/05	6/9/05	bu/ac	lb/bu	%	g	Julian	%	%	%
Choteau	Control	25.8	36.5	78.3	0.0	0.0	91.1	58.7	11.2	27.50	172.0	1.3	26.3	13.6
	Everest	19.0	33.3	78.8	30.0	10.0	86.5	59.6	11.2	28.90	173.3	0.0	23.8	13.3
	Silverado	18.5	33.8	78.8	26.3	11.3	91.5	59.1	11.2	28.92	173.0	0.0	21.3	13.6
Hank	Control	27.8	40.8	80.0	0.0	0.0	88.8	55.4	10.4	33.38	171.0	0.0	10.0	13.5
	Everest	21.3	36.0	80.5	23.8	6.3	86.9	56.4	10.8	34.69	172.3	0.0	12.5	12.9
	Silverado	21.5	36.5	79.8	25.0	10.0	89.2	55.5	10.4	32.72	172.0	0.0	12.5	13.3
McNeal	Control	26.5	37.0	89.3	0.0	0.0	54.8	53.1	9.2	26.05	173.5	0.0	57.5	13.3
	Everest	20.0	33.5	86.3	25.0	3.8	53.2	54.7	9.5	26.97	174.8	0.0	57.5	12.7
	Silverado	19.8	35.0	86.5	27.5	6.3	54.4	53.4	9.3	26.21	175.0	0.0	55.0	13.0
Outlook	Control	25.3	34.3	88.8	0.0	0.0	83.5	54.3	9.7	27.97	174.5	0.0	10.0	13.0
	Everest	18.8	33.3	86.8	21.8	5.0	79.2	54.8	9.8	27.08	176.0	0.0	11.3	12.4
	Silverado	17.3	31.3	89.5	33.3	11.3	82.7	54.4	9.8	26.47	175.8	0.0	12.5	12.5
Reeder	Control	28.3	40.8	89.0	0.0	0.0	109.2	60.1	12.1	32.28	172.0	2.5	11.3	13.0
	Everest	24.3	38.3	87.5	12.5	3.8	100.1	60.1	12.4	32.44	172.8	2.5	10.0	12.7
	Silverado	23.0	32.3	87.5	15.0	2.5	102.7	59.6	11.7	31.94	172.8	1.3	13.8	13.4
MT0245	Control	28.3	40.3	84.3	0.0	0.0	94.6	57.4	11.0	29.56	172.8	3.8	16.3	13.4
	Everest	23.0	37.8	83.5	10.8	2.5	86.7	57.2	11.0	29.32	173.5	5.0	20.0	13.8
	Silverado	21.5	38.8	83.3	15.8	3.8	94.4	56.7	10.7	29.93	173.0	5.0	11.3	14.0

Table 1 (Continued). Crop injury and agronomic data in spring wheat cultivars as influenced by Everest and Silverado herbicides at Kalispell, MT during 2005.

Cultivar	Treatment	Plant height (cm)			Crop injury (%)		Yield	Test weight	Grain moisture	TKW	Heading	Lodging	Stripe rust	Protein
		5/24/05	6/9/05	7/22/05	5/26/05	6/9/05							7/8/05	
							bu/ac	lb/bu	%	g	Julian	%	%	%
MT0260	Control	26.8	39.8	88.8	0.0	0.0	96.2	57.0	11.8	31.60	173.5	16.8	37.5	12.3
	Everest	22.3	34.8	87.8	12.5	2.5	92.5	55.6	12.0	31.10	174.8	20.5	47.5	12.5
	Silverado	22.5	36.8	89.8	15.0	4.5	90.9	55.6	11.5	30.68	175.0	23.8	42.5	12.9
MTHW0202	Control	29.8	43.0	83.8	0.0	0.0	94.4	60.4	11.1	34.92	165.5	0.0	8.8	13.1
	Everest	21.8	40.0	83.3	16.3	7.5	90.6	60.7	11.2	34.91	166.0	0.0	8.8	12.7
	Silverado	23.0	41.3	82.8	19.5	10.0	99.4	60.8	11.1	35.59	166.0	0.0	8.8	12.7
LSD (0.05)	Herbicide (A)	0.9	1.8	NS	1.6	1.3	2.1	NS	0.2	NS	0.2	NS	NS	
	Cultivar (B)	1.5	3.0	2.4	2.6	2.1	3.4	0.7	0.4	0.77	0.4	3.0	5.5	
	AxB	NS	NS	NS	4.5	3.6	NS	NS	NS	NS	NS	NS	NS	

NS: Not significant (P>0.05).

Table 2. Crop injury and agronomic data in spring wheat cultivars as influenced by Everest and Silverado herbicides at Huntley, MT during 2005.

Cultivar	Treatment	Crop injury (%)				Yield	Test weight	Grain moisture	TKW	Protein
		5/20/05	6/6/05	6/24/05	7/8/05					
						bu/ac	lb/bu	%	g	
Choteau	Control	0.0	0.0	0.0	0.0	80.8	60.4	14.1	27.1	9.1
	Everest	5.0	3.8	3.8	3.3	95.0	61.5	14.0	26.4	10.2
	Silverado	12.5	11.3	10.0	12.3	92.1	61.6	14.1	28.7	9.9
Hank	Control	0.0	0.0	0.0	0.0	87.2	60.2	13.4	33.0	9.7
	Everest	3.8	0.0	0.0	0.0	99.8	60.7	13.5	33.8	10.4
	Silverado	5.0	2.5	0.0	0.0	103.5	60.7	13.5	34.4	10.3
McNeal	Control	0.0	0.0	0.0	0.0	76.0	61.8	13.3	29.8	10.3
	Everest	7.5	5.0	5.0	4.5	89.9	61.8	13.4	29.5	11.1
	Silverado	7.5	6.3	6.3	5.8	86.5	61.9	13.0	30.1	10.7
Outlook	Control	0.0	0.0	0.0	0.0	89.2	61.0	13.3	27.9	10.0
	Everest	5.0	1.3	3.8	2.5	100.4	61.5	13.1	27.9	10.2
	Silverado	1.3	1.3	2.5	2.5	97.3	61.3	13.3	28.9	10.0
Reeder	Control	0.0	0.0	0.0	0.0	83.8	61.2	13.8	28.0	10.4
	Everest	2.5	3.8	7.5	7.5	86.8	61.8	13.5	28.3	10.8
	Silverado	7.5	7.5	8.3	8.8	87.4	61.8	13.4	28.8	10.4
MT0245	Control	0.0	0.0	0.0	0.0	85.1	60.8	13.6	27.8	9.9
	Everest	2.5	1.3	1.3	1.3	96.5	61.0	13.6	27.4	10.3
	Silverado	5.0	0.0	1.3	1.3	98.4	61.2	13.7	28.5	10.1

Table 2 (Continued). Crop injury and agronomic data in spring wheat cultivars as influenced by Everest and Silverado herbicides at Huntley, MT during 2005.

Cultivar	Treatment	Crop injury (%)				Yield	Test weight	Grain moisture	TKW	Protein
		5/20/05	6/6/05	6/24/05	7/8/05	bu/ac	lb/bu	%	g	
MT0260	Control	0.0	0.0	0.0	0.0	81.5	61.0	13.9	32.6	9.4
	Everest	3.8	6.3	6.3	4.0	103.2	61.5	13.8	32.2	9.5
	Silverado	2.5	2.5	3.8	3.3	95.9	61.5	13.7	33.5	9.5
MTHW0202	Control	0.0	0.0	0.0	0.0	86.4	62.7	13.7	30.7	9.6
	Everest	0.0	0.0	1.3	1.3	95.1	62.9	13.6	30.6	10.8
	Silverado	7.5	0.0	0.0	0.0	90.4	62.9	13.7	31.6	9.3
LSD (0.05)	Herbicide (A)	1.5	1.4	1.6	1.4	4.7	0.2	NS	0.6	
	Cultivar (B)	2.5	2.2	2.6	2.3	7.7	0.3	0.3	1.0	
	AxB	4.4	3.8	4.5	4.1	NS	NS	NS	NS	

NS: Not significant (P>0.05).

Table 3. Effects of herbicides on spring wheat stem solidness and agronomic performance in 2005.

Trt No.	Treatment name	Rate (lb a/a)	Appl. code	Stem solidness: Internode 1	Internode 2	Internode 3	Internode 4	Internode 5	Total	Yield bu/ac	Test weight lb/bu	Grain moisture %	Protein %
1	Clarity	0.1250	A	3.2	2.5	2.9	3.0	3.1	15.0	54.9	60.5	11.9	13.2
2	2,4-D ester	0.9500	A	3.0	2.6	3.0	3.2	3.5	15.3	50.5	59.5	11.3	13.6
3	Stinger	0.1240	A	3.1	2.5	2.4	2.7	2.9	14.3	56.0	59.0	11.1	14.5
4	Starane	0.1250	A	3.3	2.6	2.7	2.8	3.1	14.7	51.1	59.0	11.3	14.2
5	Everest	0.0262	A	4.1	2.7	2.9	3.3	3.4	17.2	45.1	59.5	11.8	14.5
6	Silverado	0.0028	A	3.6	3.0	3.1	3.4	3.3	16.6	50.9	59.7	12.1	13.5
7	Express	0.0156	A	3.0	2.4	2.6	3.1	3.8	15.3	51.0	60.8	12.1	12.6
8	Ally	0.0038	A	3.3	2.6	3.3	3.7	4.3	17.3	47.0	61.0	11.8	12.8
9	Pinoxaden	0.0520	A	3.6	2.5	2.3	2.5	3.1	15.0	53.9	59.2	11.4	13.7
10	Hoelon	1.0000	A	3.8	2.9	2.8	3.1	3.4	18.1	52.7	59.4	11.4	13.6
11	Discover	0.0500	A	3.9	2.8	2.8	3.0	3.6	17.1	50.0	59.6	11.6	14.1
12	Achieve	0.1800	A	3.7	2.7	2.7	3.0	3.4	16.9	57.4	59.9	11.5	13.5
13	Stinger	0.1240	B	3.2	2.8	3.0	3.4	3.6	17.0	49.9	60.4	11.7	13.5
14	Express	0.0156	B	3.1	2.4	2.6	3.0	3.9	15.3	50.9	60.1	11.5	13.0
15	Discover	0.0500	B	3.6	3.0	3.0	2.9	4.2	17.6	52.6	59.2	11.0	12.5
16	Check			3.2	2.4	2.8	3.3	3.3	15.9	52.8	60.1	11.9	12.7
	Mean			**3.4**	**2.7**	**2.8**	**3.1**	**3.5**	**16.2**	**51.7**	**59.8**	**11.6**	**13.5**
	LSD (0.05)			**NS**	**NS**	**NS**	**NS**	**0.78**	**NS**	**NS**	**1.13**	**0.71**	

A: 3-4-leaf stage; B: Flag-leaf; NS: Not significant (P>0.05).

Table 4. Effects of herbicides applied at 3-4-leaf stage on spring wheat stem solidness and agronomic performance when grouped by mode of action.

Treatments	Mode of action	Appl. code	Stem solidness						Yield	Test weight	Grain moisture	Protein
			Internode					Total				
			1	2	3	4	5		bu/ac	lb/bu	%	%
Trt: 1-4	Auxinic	A	3.1	2.6	2.7	2.9	3.2	14.8	53.1	59.5	11.4	13.9
Trt: 5-8	ALS	A	3.5	2.7	3	3.4	3.7	16.6	48.5	60.3	11.9	13.4
Trt: 9-12	ACCase	A	3.7	2.7	2.7	2.9	3.4	16.8	53.5	59.5	11.5	13.7
Mean			**3.4**	**2.7**	**2.8**	**3.1**	**3.4**	**16.1**	**51.7**	**59.8**	**11.6**	**13.7**
LSD (0.05)			**0.49**	**NS**	**NS**	**0.38**	**0.41**	**1.65**	**4.61**	**0.65**	**0.33**	

A: 3-4-leaf stage; NS: Not significant (P>0.05).

Project Title: Effects of Spring Wheat Cultivar and Seed Size on Herbicide Tolerance

Project Leaders: Bob Stougaard

Project Personnel: Qingwu Xue and Fernando Guillen

Objective: To evaluate the effects of cultivar and seed size on crop injury after application of grass herbicides in spring wheat

Results:

Reeder, Scholar and McNeal spring wheats were evaluated for tolerance to Everest, Puma, and Silverado as a function of seed size. Seed size classes were obtained by passing seed over 2.4 and 1.9 mm sieves. Large seed was that retained on the 2.4 mm sieve and small seed was that which passed through the 2.4 mm sieve but was retained on the 1.9 mm sieve. The spring wheat plots were planted on April 16, 2005 at a seeding rate of about 90 lb/ac, on 6 inches row spacings, seeded to a depth of 2 inches. Three herbicides, Everest (0.026 lb ai/a), Puma (0.083 lb ai/a) and Silverado (0.0028 lb ai/a), were applied with a CO_2 backpack sprayer in 20 GPA of water using XR11002 nozzles on May 11, 2005. Wheat plants were at three-main-stem-leaf stage and about 4 inches when herbicides were applied.

Crop injury was observed at 1-2 weeks after herbicides application. Among the herbicides, Silverado and Everest resulted in more severe crop injury than Puma. For three cultivars, Reeder had less injury than Scholar and McNeal. At 4 weeks after application, crop injury from Everest and Puma had diminished; however, Scholar and McNeal plants still had 7.5-10% injury from Silverado. Seed size had no effect on crop injury. Due to herbicide injury, plant height was reduced initially, but there was no herbicide effect on final height. Yield differences were detected among herbicide treatments, with Puma and Silverado resulting in slightly lower yields. However, herbicide effect on yield was generally minimal (<8%). Spring wheat seed size did not affect yield. Among the three cultivars, McNeal had severe stripe rust and only yielded about 50 bu/ac, while Reeder and Scholar yielded 80-100 bu/ac.

Summary:

Although crop injury occurred initially after herbicide application, the injury diminished as the growing season progressed. As a result, the application of Everest, Puma and Silverado had no effect on yield. Seed size had no effect on crop injury. However, Reeder appeared to be more tolerant to the herbicides than either Scholar or McNeal.

Table 1. Effects of spring wheat cultivar and seed size on crop injury and agronomic performance after application of wild oat herbicides.

Treatment	Cultivar	Seed size	Crop Injury (%)			Plant height (cm)			Yield (bu/ac)	Heading (Julian)	Stripe rust (%)
			5/18/05	5/27/05	6/9/05	5/24/05	6/9/05	7/22/05			7/8/05
Untreated	Reeder	Large	0.0	0.0	0.0	24.5	40.3	89.0	98.1	171.8	10.0
	Reeder	Small	0.0	0.0	0.0	23.8	40.0	89.5	104.1	172.0	8.8
	Scholar	Large	0.0	0.0	0.0	22.5	38.3	94.3	88.0	173.5	11.3
	Scholar	Small	0.0	0.0	0.0	23.0	35.5	95.8	87.0	174.5	10.0
	McNeal	Large	0.0	0.0	0.0	22.3	35.3	90.5	56.9	174.0	52.5
	McNeal	Small	0.0	0.0	0.0	23.0	34.8	94.5	56.9	174.5	55.0
Everest (0.026 lb ai/a)	Reeder	Large	20.0	3.8	0.0	22.8	39.3	91.0	98.4	172.0	12.5
	Reeder	Small	16.3	5.0	0.0	23.5	39.5	95.0	96.0	172.0	11.3
	Scholar	Large	33.8	12.5	1.3	18.8	36.5	98.3	87.5	174.5	10.0
	Scholar	Small	27.5	12.5	1.3	19.3	36.5	94.8	88.5	175.0	10.0
	McNeal	Large	27.5	10.0	1.3	19.8	32.8	92.0	52.9	175.0	52.5
	McNeal	Small	26.3	12.5	0.0	19.0	32.8	89.3	56.2	175.3	57.5
Puma (0.083 lb ai/a)	Reeder	Large	2.5	1.3	0.0	25.5	37.5	91.8	86.2	172.3	10.0
	Reeder	Small	6.3	2.0	0.0	25.8	38.8	91.0	91.1	172.3	10.0
	Scholar	Large	11.3	3.8	0.0	20.8	38.3	97.8	81.3	174.0	10.0
	Scholar	Small	8.8	5.0	0.0	22.8	37.5	96.8	88.1	175.0	7.5
	McNeal	Large	12.5	3.8	0.0	22.5	34.0	95.3	49.6	174.3	52.5
	McNeal	Small	6.3	5.0	0.0	22.5	35.3	92.5	51.2	174.5	52.5

(Continued on next page)

Table 1 (Continued). Effects of spring wheat cultivar and seed size on crop injury and agronomic performance after application of wild oat herbicides.

Treatment	Cultivar	Seed size	Crop Injury (%)			Plant height (cm)			Yield (bu/ac)	Heading (Julian)	Stripe rust (%)
			5/18/05	5/27/05	6/9/05	5/24/05	6/9/05	7/22/05			7/8/05
Silverado	Reeder	Large	28.8	12.5	3.8	20.5	36.8	92.0	94.2	172.3	11.3
(0.0028 lb ai/a)	Reeder	Small	28.8	12.5	1.3	21.3	37.0	90.5	95.1	172.3	15.0
	Scholar	Large	47.5	23.8	10.0	15.5	32.8	98.5	85.9	176.0	7.5
	Scholar	Small	45.0	25.0	7.5	17.3	35.3	99.5	79.9	176.3	10.0
	McNeal	Large	41.3	21.3	8.8	17.8	31.8	90.8	52.2	175.3	52.5
	McNeal	Small	43.8	23.8	7.5	18.5	32.0	91.3	53.1	175.8	50.0
LSD (0.05)	Herbicide		3.05	1.53	0.98	0.81	1.17	NS	3.39	0.38	NS
	Cultivar		2.64	1.33	0.84	0.71	1.02	1.49	2.92	0.33	2.19
	Seed size		NS	NS	0.69	0.58	NS	NS	NS	0.27	NS

NS: Not significant (P>0.05).

Project Title: White Cockle Control by Auxinic Herbicides

Project Leader: Bob Stougaard

Project Personnel: Qingwu Xue

Objective: To evaluate auxinic herbicides for white cockle control

Results:

White cockle is a troublesome perennial weed and frequently interferes with crops like peppermint. This study was designed to evaluate auxinic herbicides for the control of white cockle. White cockle populations were established by planting seeds on April 27, 2004 using a double disk drill. Treatments included four auxinic herbicides (Clarity, Tordon, Garlon and Starane) applied at three rates (0.125, 0.25 and 0.5 lb ai/a) and an untreated check, totaling 13 treatments. The herbicides were applied on April 18, 2005 using a CO_2 backpack sprayer in 20 GPA of water using XR11002 nozzles. At application, newly emerged seedlings and established plants (3-4" tall and 5" diameter) from previous year were present.

All herbicide treatments resulted in some degree of weed injury at 4 weeks after application. However, Clarity, Garlon and Tordon provided more injury than Starane. Comparing weed biomass at 10 weeks after application, treatments with moderate to high rates (0.25 and 0.5 lb ai/a) of Clarity and Garlon had lower biomass than other treatments.

Summary:

Clarity and Garlon are promising herbicides for white cockle control.

Table 1. Effects of Clarity, Tordon, Garlon, and Starane on white cockle control in 2005.

Trt No.	Treatment name	Rate	Product rate	Weed injury	Fresh weight	Dry weight
		lb ai/a	pt/a	%	ton/ac	ton/ac
				5/18/05	7/1/05	7/1/05
1	Clarity	0.125	0.25	40.0	12.0	2.1
2	Clarity	0.250	0.50	68.3	7.7	1.4
3	Clarity	0.500	1.00	81.7	3.5	0.6
4	Tordon 22K	0.125	0.50	18.3	10.8	1.9
5	Tordon 22K	0.250	1.00	25.0	10.0	1.8
6	Tordon 22K	0.500	2.00	46.7	9.2	1.6
7	Garlon	0.125	0.25	53.3	9.2	1.6
8	Garlon	0.250	0.50	73.3	8.6	1.5
9	Garlon	0.500	1.00	83.3	5.6	1.0
10	Starane	0.125	0.67	8.3	12.3	2.2
11	Starane	0.250	1.33	10.0	12.2	2.2
12	Starane	0.500	2.67	11.7	12.4	2.2
13	Untreated			0.0	11.8	2.1
LSD (P=0.05)				12.75	3.32	0.59
CV (%)				18.91	20.42	20.42
Treatment F				46.98	5.89	5.89
Treatment Prob(F)				0.0001	0.0001	0.0001

Project Title: Evaluation of Clearfield Winter Wheat Lines for Herbicide Tolerance.

Project Leader: Bob Stougaard

Project Personnel: Qingwu Xue, Fernando Guillen, Phil Bruckner, and Jim Berg

Objectives: Evaluate crop tolerance, yield potential and agronomic attributes of experimental herbicide resistant winter wheat lines.

Results:

During the 2004-05 season, fifteen herbicide resistant (Clearfield) winter wheat lines and one susceptible cultivar (Neeley) were evaluated for their agronomic performance when treated with Beyond (imazamox) applied at 2 times the labeled rate (12 oz/a). The herbicide application was made on April 19, 2005 using a tractor –mounted sprayer when seedlings were at the jointing stage. Non-treated controls were included for comparison.

A mild winter helped to maintain good stands. Although snow pack was lower than normal, soil moisture was still adequate for tillering in spring. In addition, exceptional high precipitation (8 in) in June resulted in high yield potential. Unfortunately, the wet conditions also provided ideal conditions for stripe rust to develop. As a result, yield was largely determined by resistance to stripe rust. Yields varied from over 100 bu/ac to as low as 9 bu/ac. Stripe rust significantly reduced test weight which ranged from 64.8 lb/bu (MTCL0461 and MTCL0318) to 40 lb/bu (NWCL042). Julian heading date was later than the previous season and averaged 155. Plant height ranged from 34.8 inches to 45.1 inches and averaged 40 inches. Lodging was minimal and only observed in the nontreated entries.

Herbicide injury was minimal among the entries evaluated, having little effect on test weight and protein. However, herbicide application tended to decreased plant height and reduced lodging. Consequently, yields were greater when treated with the herbicide. This response was especially evident with MTCL0461 and MTCL0318.

Summary:

The 2004-05 season was ideal for evaluating stripe rust resistance. Several Clearfield entries (NWCL013, MTCL0461, MTCL0489 and MTCL0318) showed excellent resistance to stripe rust and had high yields. However, some entries were very susceptible to stripe rust.

Future Plans:

Continue to evaluate herbicide resistant winter wheat materials for herbicide tolerance and agronomic attributes

Table 1. Agronomic data from the Clearfield winter wheat lines grown at the Northwestern Agricultural Research Center, Kalispell, MT in 2004-2005 season.

Planted: September 27, 2004 Harvested: August 10, 2005

Entry	ID	Yield (bu/ac)		Grain moisture (%)		Test weight (lb/bu)		Heading date (Julian)		Plant height (in)		Protein (%)	
		0X	2X	0X	2X	0X	2X	0X	2X	0X	2X	0X	2X
12	NWCL013	125.5	125.3	11.3	11.6	62.7	63.4	162.7	162.0	44.8	43.8	12.2	11.8
4	MTCL0461	123.7	131.4	10.6	10.6	63.9	64.8	154.0	153.0	40.3	38.6	14.3	13.6
10	MTCL0489	113.9	119.7	10.9	10.0	61.1	59.1	152.7	152.7	36.6	35.8	10.0	10.9
3	MTCL0318	102.7	117.5	11.1	10.5	63.1	64.8	153.7	151.3	43.6	41.9	14.0	12.6
5	MTCL0468	91.2	97.7	10.7	10.3	60.0	58.3	160.0	159.3	48.8	46.2	11.6	11.5
2	MTCL0316	81.6	84.6	9.7	10.3	57.1	56.7	153.3	151.3	45.1	42.8	13.1	13.1
7	MTCL0477	80.6	78.9	9.7	10.0	52.8	57.0	156.0	154.0	40.7	40.2	13.2	12.1
14	MTCL01159	80.3	88.2	10.4	9.8	59.5	59.3	155.3	154.7	39.9	40.2	12.4	12.2
1	MTCL0306	54.9	60.9	8.8	8.1	50.0	51.6	154.3	153.0	42.3	40.4	13.5	13.5
15	Above	45.3	46.4	9.0	8.7	50.2	50.3	150.3	150.0	37.8	34.8	12.4	12.3
8	MTCL0486	37.6	33.9	8.7	7.6	44.4	43.5	156.0	155.3	39.1	39.0	12.4	12.6
9	MTCL0487	35.5	42.2	6.9	7.5	41.2	43.3	155.3	155.3	42.7	41.5	12.7	12.9
13	NWCL034	19.4	24.6	8.2	7.0	48.3	44.8	158.7	156.0	40.0	38.6	13.0	13.2
6	MTCL0474	18.6	15.8	7.0	7.2	45.2	41.1	156.0	156.0	40.2	38.1	13.4	13.7
11	NWCL042	9.0	10.4	6.8	7.2	41.4	40.3	156.7	155.7	38.2	40.0	13.6	13.3
	Mean	**68.0**	**71.8**	**9.3**	**9.1**	**53.4**	**53.2**	**155.7**	**154.6**	**41.3**	**40.1**	**12.8**	**12.6**
16	Neeley	34.3		8.8		45.8		158.7		42.4		13.1	
	LSD (0.05)												
	Entry	**8.67**						**1.57**		**2.12**			
	Rate	**3.02**						**0.55**		**0.74**			

Table 2. Lodging, crop injury and stripe rust infection in Clearfield winter wheat lines grown at the Northwestern Agricultural Research Center, Kalispell, MT in 2004-2005 season.

Planted: September 27, 2004 Harvested: August 10, 2005

Entry	ID	Lodging (%)		Crop injury (14 DAT)		Crop injury (28 DAT)		Stripe rust (6-9-05)		Stripe rust (6-23-05)	
		0X	2X	0X	2X	0X	2X	0X	2X	0X	2X
12	NWCL013	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	4.3	2.3
4	MTCL0461	43.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	MTCL0489	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	6.7
3	MTCL0318	50.0	0.0	0.0	6.7	0.0	0.0	0.0	0.0	6.7	6.7
5	MTCL0468	6.7	0.0	1.7	0.0	0.0	0.0	4.0	1.7	18.3	15.0
2	MTCL0316	0.0	0.0	0.0	0.0	0.0	0.0	4.3	1.7	43.3	53.3
7	MTCL0477	3.3	0.0	1.7	0.0	0.0	0.0	6.7	3.3	58.3	73.3
14	MTCL01159	0.0	0.0	0.0	3.3	0.0	0.0	2.3	1.7	8.3	11.7
1	MTCL0306	10.0	0.0	0.0	0.0	0.0	0.0	7.3	8.3	60.0	46.7
15	Above	0.0	0.0	3.3	11.7	0.0	1.7	19.3	8.3	73.3	76.7
8	MTCL0486	0.0	0.0	0.0	1.7	0.0	0.0	30.0	28.3	75.0	80.0
9	MTCL0487	0.0	0.0	0.0	0.0	0.0	0.0	33.3	14.0	86.7	81.7
13	NWCL034	1.7	0.0	1.7	1.7	0.0	0.0	10.0	3.3	66.7	66.7
6	MTCL0474	16.7	0.0	0.0	0.0	0.0	0.0	13.3	16.7	75.0	76.7
11	NWCL042	20.0	0.0	1.7	3.3	0.0	0.0	18.3	10.0	83.3	83.3
	Mean	**10.1**	**0.0**	**0.7**	**2.0**	**0.0**	**0.1**	**9.9**	**6.5**	**44.1**	**45.4**
16	Neeley	0.0		1.7	80.0	0.0	100.0	58.3		95.0	
	LSD (0.05)										
	Entry	**14.84**		**2.84**		**0.59**		**12.15**		**9.18**	
	Rate	**5.18**		**1.00**		**0.21**		**4.24**		**NS**	

DAT: Days after treatment; NS: Not significant at the level of 0.05.

Project Title: Evaluation of Clearfield Winter Wheat Lines for Yield and Herbicide Tolerance

Project Leader: Bob Stougaard

Project Personnel: Qingwu Xue, Fernando Guillen, Phil Bruckner, and Jim Berg

Objectives: Evaluate yield potential and agronomic performance of experimental herbicide resistant winter wheat lines.

Results:

Thirty-five herbicide resistant (Clearfield) winter wheat lines and one susceptible cultivar (Neeley) were evaluated for their agronomic performance when treated with Beyond (imazamox) at the labeled rate of 6 oz/a. The herbicide application was made on April 19, 2005 using a tractor-mounted sprayer when seedlings were at the jointing stage.

A mild winter and high soil moisture in spring favored wheat stands and tillering. In addition, exceptional high precipitation (8 in) at June resulted in high yield potential. However, the wet conditions in June provided ideal conditions for stripe rust to develop. As a result, yield was directly related to stripe rust resistance and varied from 134.5 bu/ac (MTCL0548) to 9.3 bu/ac (NWCL035). Grain test weight was also affected by stripe rust and ranged from 37 to 64 lb/bu. Heading date averaged on Julian 157, ranging from 153 to 160. Plant height averaged 41 inches. Lodging was minimal for most of the entries, and only 7 entries had more than 12% lodging. Crop injury due to herbicide application was also minimal and only 3 entries had 12.5-17.5% injury. Grain protein ranged from 10.3% to 13.9% with average of 12.9%.

Summary:

The 2004-05 was ideal for evaluating stripe rust resistance. Nine Clearfield entries showed excellent resistance to stripe rust and had yields over 100 bu/ac. However, some entries were very susceptible to stripe rust and resulted in very low yields. Nonetheless, all entries demonstrated excellent herbicide resistance.

Table 1. Agronomic data from the Clearfield winter wheat lines grown at the Northwestern Agricultural Research Center, Kalispell, MT during the 2004-2005 season.

Planted: September 27, 2004 Harvested: August 10, 2005

Entry	ID	Yield	Grain moisture	Test weight	Heading date	Plant height	Lodging	Crop Injury 14 DAT	Crop Injury 28 DAT	Stripe rust 6/9/05	Stripe rust 6/23/05	Protein
		Bu/A	%	Lb/Bu	Julian	in	%	%	%	%	%	%
34	MTCL0548	134.5	10.5	58.9	158.5	39.0	0.0	5.0	2.5	0.0	0.0	12.1
35	MTCL0549	131.8	11.3	61.3	153.0	39.4	0.0	0.0	0.0	0.0	2.5	10.3
36	MTCL0550	126.3	10.0	57.1	160.0	39.0	0.0	5.0	7.5	0.0	5.0	11.7
24	MTCL0538	119.8	11.3	64.0	153.0	42.5	0.0	5.0	0.0	0.0	3.5	12.5
14	MTCL0509	109.6	10.7	64.1	158.0	45.1	2.5	2.5	5.0	0.0	3.5	13.8
23	MTCL0537	108.0	11.7	60.8	159.5	47.0	30.0	0.0	0.0	0.0	12.5	12.1
26	MTCL0540	105.8	10.1	56.3	156.0	39.6	20.0	1.5	0.0	0.0	2.5	13.2
15	MTCL0510	105.5	9.5	57.1	159.5	37.4	0.0	0.0	0.0	0.0	10.0	13.3
4	MTCL0318	104.6	11.0	64.9	154.0	43.9	12.5	0.0	5.0	0.0	2.5	12.9
13	MTCL0508	102.9	10.5	64.5	154.5	39.4	2.5	1.5	12.5	0.0	22.5	13.9
3	MTCL0316	98.9	9.7	58.1	152.0	41.9	0.0	0.0	0.0	0.0	45.0	13.3
16	MTCL0511	98.3	9.2	55.9	154.5	37.6	35.0	7.5	0.0	0.0	20.0	13.1
1	MTCL01159	97.9	10.5	59.7	155.5	40.0	0.0	7.5	0.0	0.0	7.5	12.4
12	MTCL0507	95.1	11.0	62.6	159.0	41.9	42.5	5.0	7.5	1.5	10.0	12.9
29	MTCL0543	91.9	9.0	53.0	154.0	39.6	0.0	0.0	5.0	0.0	40.0	13.0
10	MTCL0505	85.5	11.1	61.1	160.0	41.5	0.0	2.5	15.0	7.5	27.5	10.9
11	MTCL0506	83.4	9.5	58.2	159.0	42.3	50.0	2.5	0.0	0.0	45.0	13.5
28	MTCL0542	81.2	8.9	52.1	154.5	40.7	0.0	0.0	0.0	4.0	50.0	13.3
8	MTCL0503	77.7	10.1	58.2	159.0	42.9	2.5	0.0	0.0	0.0	30.0	13.1
7	MTCL0502	72.9	9.7	57.3	160.0	44.3	7.5	2.5	5.0	1.5	35.0	13.6
21	MTCL0535	69.7	10.1	56.2	159.0	44.5	0.0	0.0	5.0	5.0	60.0	13.0
33	MTCL0547	68.7	8.4	48.6	156.0	37.6	0.0	15.0	17.5	4.0	40.0	11.6
20	MTCL0534	68.3	10.0	54.4	159.0	49.8	2.5	5.0	0.0	8.5	55.0	12.9
25	MTCL0539	67.5	9.0	52.6	156.0	47.6	0.0	0.0	0.0	2.5	45.0	13.2
2	MTCL0306	58.8	9.2	51.8	154.0	42.1	0.0	0.0	0.0	12.5	50.0	13.2

Table 1 (continued). Agronomic data from the Clearfield winter wheat lines grown at the Northwestern Agricultural Research Center, Kalispell, MT during the 2004-2005 season.

Planted: September 27, 2004 | Harvested: August 10, 2005

Entry	ID	Yield	Grain moisture	Test weight	Heading date	Plant height	Lodging	Crop Injury 14 DAT	Crop Injury 28 DAT	Stripe rust 6/9/05	Stripe rust 6/23/05	Protein
		Bu/A	%	Lb/Bu	Julian	in	%	%	%	%	%	%
22	MTCL0536	56.1	8.5	51.1	159.0	37.8	0.0	0.0	0.0	7.5	65.0	12.7
6	MTCL0501	51.5	8.8	51.6	156.0	37.0	0.0	0.0	0.0	0.0	12.5	13.6
9	MTCL0504	40.8	7.5	45.5	161.0	40.2	0.0	0.0	0.0	7.5	82.5	13.0
32	MTCL0546	36.1	8.3	47.0	160.5	41.9	0.0	0.0	0.0	5.0	60.0	12.2
19	NWCL025	28.3	7.1	45.7	156.0	38.0	0.0	5.0	7.5	12.5	70.0	13.8
30	MTCL0544	23.4	8.2	43.7	156.0	37.6	0.0	4.0	0.0	27.5	77.5	13.2
31	MTCL0545	23.2	6.5	37.7	158.5	40.4	0.0	0.0	0.0	25.0	75.0	13.7
17	NWCL018	19.9	7.7	45.0	159.0	38.0	0.0	2.5	0.0	15.0	70.0	13.1
27	MTCL0541	15.9	7.1	36.9	154.0	36.4	0.0	0.0	0.0	22.5	92.5	14.1
18	NWCL035	9.3	9.5	49.3	160.0	38.2	25.0	0.0	0.0	12.5	65.0	13.4
	Mean	**76.2**	**9.5**	**54.4**	**157.1**	**40.9**	**6.6**	**2.3**	**2.7**	**5.2**	**37.0**	**12.9**
5	Neeley							80.0	100.0			
	c.v. (%)	**11.25**			**1.24**	**5.76**	**267.39**	**71.22**	**93.98**	**119.61**	**30.79**	
	LSD (0.05)	**17.44**			**3.96**	**4.79**	**36.10**	**6.41**	**10.33**	**13.02**	**23.14**	

Project Title:	Agronomic Performance Evaluation of Intrastate Winter Wheat Cultivars
Project Leader:	Bob Stougaard
Project Personnel:	Qingwu Xue, Fernando Guillen, Phil Bruckner, and Jim Berg

Objectives:

To evaluate new and existing winter wheat cultivars for agronomic performance and disease resistance in environments and cropping systems representative of northwestern Montana.

Results:

A mild winter helped to maintain excellent wheat stands into the spring. Although snow pack was lower than normal, soil moisture was still adequate for tillering in spring. In addition, exceptional high precipitation (8 in) during June resulted in high yield potential. Unfortunately, the wet conditions also provided ideal conditions for stripe rust infestation. Overall, resistance to this disease largely determined yield. Yields ranged from 130 bu/ac for Promontory to 12 bu/ac for Paul. Stripe rust not only affected yield but also reduced grain test weight. Test weight ranged from 64.5 lb/bu in MT001148 to 39.4 lb/bu in NuWest. Julian heading date averaged 155, ranging from 150 to 164. Plant height was taller than normal and averaged 40 inches. Although precipitation was high in June, most entries did not lodging. Only a few entries (Rampart, Vanguard, MTS0333 and Rocky) had over 40% lodging. Grain protein ranged from 10.6% to 14.3% and averaged 12.2%.

Summary:

The 2004-05 season was ideal for evaluating stripe rust resistance. The top yielding entries (Promontory, MT03177, MT9982-65, MT00159 and WA7936) showed excellent resistance to stripe rust. However, some entries (MT02136, MTW01133 and Paul) were very susceptible to stripe rust and resulted in very low yield and test weight.

Future Plans:

Continue winter wheat evaluations for the purpose of identifying those cultivars best suited for production in northwestern Montana.

Table 1. Agronomic data from the Intrastate Winter Wheat Nursery Grown at the Northwestern Agricultural Research Center, Kalispell MT in 2004-05 season.

Planted: September 27, 2004
Harvested: August 10, 2005

Entry	Cultivar	Yield	Test weight	Grain moisture	Heading date	Plant height	Lodging	Stripe rust 6/9/05	Stripe rust 6/23/05	Protein
		bu/ac	lb/bu	%	Julian	in	%	%	%	%
10	Promontory	130.7	61.6	10.8	155.0	38.1	0.0	0.0	3.0	11.1
49	MT03177	126.6	62.4	11.2	152.0	41.9	0.0	0.0	3.3	10.7
39	MT9982-65	126.3	61.7	11.1	155.0	39.2	0.0	0.0	6.7	11.7
29	MT00159	126.0	61.9	12.5	155.3	38.8	0.0	0.0	5.0	11.6
33	WA7936 (HWW)	126.0	55.6	24.6	164.3	39.4	1.7	0.7	4.0	11.4
38	MT9982-53	122.9	62.7	11.3	156.7	40.0	0.0	0.0	5.7	11.9
28	MT0097	122.7	63.6	12.5	154.7	40.2	6.7	0.0	3.3	11.5
31	MT01148	122.5	64.5	12.4	157.0	43.6	0.0	0.0	8.3	11.3
22	Jagalene	121.8	62.8	12.2	153.0	39.4	0.0	0.0	3.3	12.4
48	MT03176	113.5	61.3	12.0	150.7	40.8	5.0	0.7	5.0	11.6
46	MTS0360	110.5	63.2	11.3	157.3	40.3	6.7	0.0	8.3	13.4
12	NuFrontier (HWW)	109.6	64.3	11.5	150.7	40.2	0.0	0.0	8.3	10.6
44	MTCL0318 (IMI)	108.0	64.2	10.8	152.3	44.2	30.0	0.0	5.0	13.0
14	Quantum 542	105.8	60.1	10.4	152.3	43.2	3.3	0.0	5.7	13.6
32	WA7939	104.8	56.0	19.6	162.7	39.1	26.7	4.3	10.0	11.3
41	Hatcher	99.0	59.4	11.0	151.0	37.3	0.0	0.0	50.0	11.8
7	Bighorn	95.2	59.2	10.0	155.3	36.9	10.0	0.0	0.7	11.2
1	Rampart	93.4	63.8	10.6	155.3	41.5	63.3	0.0	6.7	12.6
20	BZ9W96-788	90.1	.	10.8	152.3	38.6	0.0	0.0	10.0	.
4	Vanguard	90.0	62.3	12.3	153.0	45.1	40.0	0.0	13.3	12.0
18	NuHorizon (HWW)	89.4	63.2	12.1	150.3	33.2	0.0	0.7	11.3	10.6
26	Millenium	85.8	60.9	11.9	153.0	43.7	0.0	0.0	20.0	11.4
34	MTCL01159 (IMI)	85.4	59.7	11.5	154.7	41.3	0.0	0.0	5.0	11.8
43	MTCL0316 (IMI)	81.6	59.1	10.8	150.3	41.2	0.0	0.0	30.0	12.9
24	Jerry	81.3	56.7	10.5	155.0	44.9	15.0	0.7	11.7	12.8
3	Tiber	74.9	54.1	10.3	156.7	46.7	26.7	8.3	70.0	12.2
45	MTS0333	72.0	59.1	11.9	155.7	40.3	66.7	0.0	25.0	13.7
8	CDC Falcon	70.0	54.3	10.7	154.3	34.3	0.0	6.7	63.3	11.5
23	Wahoo	68.7	48.7	10.5	151.3	37.3	0.0	1.0	11.7	12.8
27	Genou	68.4	55.5	11.0	155.3	42.4	1.7	1.7	46.7	12.7
21	BZ9W02-2060	68.1	61.0	12.2	153.0	34.6	0.0	6.7	40.0	12.1
6	Rocky	65.9	61.8	11.8	154.3	44.0	60.0	5.7	60.0	12.8
42	MTCL0306 (IMI)	65.4	53.6	10.5	153.0	40.3	0.0	2.3	63.3	12.3
19	GM10006 (HWW)	59.6	54.9	11.0	152.3	31.2	0.0	10.0	75.0	12.3
40	Bond CL (IMI)	59.4	53.7	11.5	150.0	42.0	0.0	26.7	95.0	11.7

(Continued on next page)

Table 1 (continued). Agronomic data from the Intrastate Winter Wheat Nursery Grown at the Northwestern Agricultural Research Center, Kalispell MT in 2003-04 season.

Planted: September 27, 2004
Harvested Auguts 10, 2005

Entry	Cultivar	Yield	Test weight	Grain moisture	Heading date	Plant height	Lodging	Stripe rust 6/9/05	Stripe rust 6/23/05	Protein
		bu/ac	lb/bu	%	Julian	in	%	%	%	%
25	Above (IMI)	57.7	52.5	9.3	150.0	37.3	0.0	3.3	56.7	12.3
13	Pryor	54.7	49.7	10.4	156.0	31.2	0.0	45.0	63.3	12.3
47	MT0383	46.3	53.7	10.8	155.0	37.4	0.0	11.7	76.7	12.6
35	MT02113	45.2	47.7	10.3	154.7	37.9	0.0	5.0	60.0	13.3
11	BigSky	40.5	47.1	8.9	155.7	44.6	0.0	15.0	85.0	13.1
15	Norstar	37.2	52.1	9.0	162.0	52.9	16.7	10.0	88.3	12.5
37	MTW02111(HWW)	36.2	50.4	10.5	160.0	41.1	0.0	15.0	71.7	12.3
5	Morgan	34.4	48.7	10.4	159.0	40.3	0.0	11.7	78.3	12.9
2	Neeley	27.4	43.8	9.3	158.3	42.3	0.0	81.7	93.3	12.7
16	NuSky (HWW)	25.3	42.8	9.2	157.7	41.7	0.0	11.7	70.0	12.1
9	NuWest (HWW)	24.5	39.4	9.0	155.7	42.8	0.0	6.0	66.7	13.2
36	MT02136	23.1	42.5	9.8	153.0	37.9	8.3	11.7	76.7	14.3
30	MTW01133	22.0	42.1	8.9	152.3	32.0	0.0	13.3	83.3	12.5
17	Paul	12.1	43.6	10.1	157.7	36.5	0.0	66.7	95.0	14.3
Mean		**74.9**	**55.5**	**11.3**	**154.8**	**40.0**	**8.4**	**827.6**	**859.0**	**12.3**
c.v. (%)		**10.86**			**0.78**	**6.05**	**152.55**	**69.56**	**25.03**	
LSD (0.05)		**13.74**			**1.95**	**3.92**	**19.59**	**8.83**	**15.39**	

IMI: Herbicide resistant winter wheat;
HWW: Hard white winter wheat.

Project Title: Montana Statewide Spring Oat Variety Performance.

Project Leader: Bob Stougaard

Project Personnel: Qingwu Xue, Fernando Guillen, Tom Blake, and Pat Hensleigh

Objectives:

To evaluate the agronomic performance of oat varieties and experimental lines in environments and cropping systems representative of northwestern Montana.

Results:

Cool temperatures and high soil moisture favored oat growth and development during the 2005 season. Unfortunately, six entries experienced moderate to severe lodging due to high rainfall in June and yield was reduced. Yields averaged 187.5 bu/ac, which was slightly lower than 2004 (192.8 bu/ac). Yields ranged from 146.8 bu/ac in Monida to 229.7 bu/ac in 96AB8597. Test weight (>32 lb/bu) was good except for Monida and 87AB5632. In general, heading date was one week later than 2004. Plant height was higher than normal and averaged 46.9 inches. Grain protein averaged 13.1%, ranging from 10.8% in 96AB8597 to 14.5% in Monida.

Summary:

High yield and good test weight were obtained in most oat entries during the 2005 season. However, the wet conditions increased plant height and resulted in severe lodging in some entries. 96AB8597, OT382, 98AB6646, 94AB5943 and Otana were top yielding entries (>200 bu/ac) and also lodging resistant.

Future Plans:

Cultivars will continue to be evaluated at Kalispell in an attempt to identify those cultivars best adapted to District 1.

Table 1. Agronomic data from the State Oat Nursery grown at the Northwestern Agricultural Research Center Kalispell, MT.

Planted: April 16, 2005
Harvested: August 29, 2005

ENTRY	Cultivar	Yield	Test weight	Grain moisture	Heading date	Plant height	Lodging	Protein
		bu/ac	lb/bu	%	Julian	in	%	%
11	96AB8597	229.7	38.4	9.3	182.3	46.7	0.0	10.8
13	OT382	224.6	38.0	9.3	180.3	51.2	0.0	13.3
9	98AB6646	214.2	37.0	9.0	179.0	44.1	0.0	13.6
14	94AB5943	214.2	36.1	8.8	177.3	46.1	4.3	12.9
1	Otana	207.8	37.6	9.4	179.3	52.6	10.0	13.7
4	CDC Pacer	192.2	34.7	8.6	178.0	47.6	6.7	12.9
3	Killdeer	189.8	33.8	8.4	177.0	45.9	40.0	13.7
5	Maverick	186.6	33.0	8.6	178.7	41.7	55.0	12.9
10	98AB6491	184.3	35.9	9.1	177.7	43.2	5.0	13.5
7	CDC Dancer	171.1	37.9	9.4	179.7	52.6	3.3	12.2
6	Monico	161.8	33.6	9.1	178.0	45.5	95.0	13.5
12	96AB8796	152.6	32.8	8.4	179.0	43.6	95.0	13.2
8	87AB5632	150.0	31.0	8.4	178.0	46.2	96.7	12.5
2	Monida	146.8	28.8	8.4	182.0	49.5	95.0	14.5
Mean		**187.5**	**34.9**	**8.9**	**179.0**	**46.9**	**36.1**	**13.1**
CV (%)		**11.43**			**0.32**	**4.63**	**49.22**	
LSD (0.05)		**35.98**			**0.95**	**3.64**	**29.86**	

Project Title: Agronomic Performance Evaluation of Soft White Winter Wheat Cultivars.

Project Leader: Bob Stougaard

Project Personnel: Qingwu Xue, Fernando Guillen, Phil Bruckner, and Jim Berg

Objectives: To evaluate the agronomic performance of soft white winter wheat cultivars in environments and cropping systems representative of northwestern Montana.

Results:

The growing season during 2004-05 was ideal for soft white winter wheat growth and development. A mild winter helped to maintain excellent wheat stands and adequate soil moisture enhanced tillering in spring. In addition, exceptionally high precipitation (8 in) in June favored grain filling. Although the wet conditions in June provided conditions conducive for stripe rust infestation, all soft white entries were resistant to the disease. Yields ranged from 143.7 bu/ac (Hill 81) to 103.3 bu/ac (Hubbard). Test weight was normal (59 lb/bu in average) among the soft white entries. Hill 81, Simon and MAC-1 had test weights over 60 lb/bu. The hard red check variety (Neeley) yielded poorly (13 bu/ac) and had low test weight due to severe stripe rust infestation. Heading ranged from Julian 153 to 165, which was longer than the previous season. Plant height was similar to previous year and averaged 38.9 inches. Lodging was minimal in most of the entries. Grain protein averaged 11.3% and was comparable to previous season (11.6%).

Summary:

The 2004-05 season was ideal for evaluating stripe rust resistance. All the soft white entries showed excellent resistance to stripe rust, had high yields and normal test weight.

Future Plans:

Continue to evaluate soft white winter wheat cultivars for adaptation in District 1.

Table 1. Agronomic data from the Soft White Winter Wheat Nursery Grown at the Northwestern Agricultural Research Center Kalispell, MT.

Planted: September 27, 2004 Harvested: August 10, 2005

Entry	Cultivar	Yield	Test weight	Grain moisture	Heading date	Plant height	Lodging	Stripe rust 6/9/05	Stripe rust 6/23/05	Protein
		bu/ac	lb/bu	%	Julian	in	%	%	%	%
8	Hill 81	143.7	62.8	12.4	161.3	39.4	0.0	0.0	0.0	11.3
12	Simon	142.7	61.2	11.3	156.0	39.1	0.0	0.0	0.0	10.6
3	Rod	139.8	59.3	12.7	161.3	40.4	0.0	0.0	3.3	10.5
10	Finch	139.3	60.9	13.1	164.3	39.9	0.0	0.0	5.0	11.5
4	MAC-1	136.6	62.5	12.0	158.0	39.9	0.0	0.0	8.3	11.0
9	Lambert	132.8	60.5	10.9	154.7	41.2	0.0	0.0	0.7	11.6
13	Masami	131.1	58.3	12.3	162.3	40.3	0.0	0.0	8.3	11.0
2	Eltan	122.2	56.6	16.4	165.3	40.2	41.7	0.0	6.7	11.6
14	WA7935	122.0	52.3	23.2	165.3	38.7	16.7	0.7	6.7	11.4
6	MacVicar	121.1	60.1	10.9	156.3	34.5	0.0	0.0	0.7	10.4
15	MTCL0489	114.6	59.1	10.7	152.7	36.1	0.0	0.0	1.7	10.1
5	Kmor	114.0	57.5	10.9	163.3	38.3	0.0	6.7	13.3	10.6
7	Lewjain	110.7	56.9	14.9	164.0	34.1	1.7	4.0	11.7	11.6
11	Hubbard	103.3	56.7	10.9	159.0	43.6	0.0	0.0	4.0	10.3
1	Neeley#	13.4	37.4	9.7	158.0	38.1	0.0	55.0	95.0	15.4
Mean		**119.2**	**57.5**	**12.8**	**160.1**	**38.9**	**4.0**	**4.4**	**11.0**	**11.3**
c.v. (%)		**6.60**			**1.29**	**3.94**	**320.67**	**205.89**	**25.47**	
LSD (0.05)		**13.15**			**3.46**	**2.56**	**21.45**	**15.23**	**4.69**	

#: Hard-red winter wheat.

Project Title:	Agronomic Performance Evaluation of Intrastate Spring Barley Cultivars.
Project Leader:	Bob Stougaard
Project Personnel:	Qingwu Xue, Fernando Guillen, Tom Blake, and Pat Hensleigh

Objectives:

To evaluate spring barley cultivars and experimental lines for agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

The 2005 season was ideal for barley growth and development. Temperature was near normal but precipitation was higher than average, particularly in June with a total of 8 inches. Wet conditions from booting to heading provided opportunities for disease infestation. Net blotch, scald and stripe rust were all observed in barley entries during grain filling. However, these diseases did not significantly affect yield and test weight. The average yield (138 bu/ac) was slightly higher than 2004 (130 bu/ac), ranging from 161.8 bu/ac for WB Xena to 118.6 bu/ac for Hays. Most entries yielded more than the check variety, Gallatin. Test weight was excellent and averaged 50.6 lb/bu. Only two entries (Tradition and Hays) had a test weight lower than 48 bu/ac. Grain plumpness was excellent and averaged 95%. Heading date (Julian 174) was later than previous year (169), ranging from Julian 170 to 182. Plant height averaged 34 inches and no lodging was observed. Grain protein was lower than previous year and averaged 11.4%.

Summary:

The 2005 season was ideal for barley growth and development. Most entries had high yields and excellent test weight. WB Xena, MT020262, MT030160, MT960101, MT030081 and YU501385 were top yielding entries (>150 bu/ac).

Future Plans:

Continue barley evaluations for the purpose of identifying cultivars best suited for District 1.

Table 1. Agronomic data from the Intrastate Spring Barley Nursery grown at the Northwestern Agricultural Research Center Kalispell, MT.

Planted: April 20, 2005 Harvested: August 23, 2005

Entry	Cultivar	Yield	Test weight	Grain moisture	heading date	Plant height	Plump	Net blotch	Scald	Stripe rust	Protein
								7/26/2005			
		bu/ac	lb/bu	%	Julian	in	%	0-4	0-3	0-3	%
5	WB Xena	161.8	50.9	13.7	175.8	36.4	95.4	2.0	0.7	0.3	10.54
40	MT020162	156.2	51.6	14.3	175.2	38.5	97.5	2.0	0.7	2.0	11.60
61	MT030160	155.0	50.6	14.2	175.7	33.9	88.9	2.0	1.3	0.0	11.71
22	MT960101	154.5	50.3	14.4	175.6	34.0	93.2	2.3	0.0	0.3	12.01
55	MT030081	154.0	51.8	14.2	173.9	36.1	96.1	3.0	0.0	1.0	10.02
17	YU501385	153.3	52.1	14.3	172.1	34.9	97.4	1.7	0.0	1.7	11.00
31	MT010081	149.3	51.6	14.0	174.3	37.2	96.2	2.3	0.0	0.0	11.49
35	MT010191	148.4	51.1	14.6	178.8	33.0	97.0	2.0	0.0	0.3	11.31
11	Merit	148.1	51.3	14.3	181.9	36.7	95.5	1.7	0.0	0.3	11.24
3	Eslick	147.6	49.5	14.0	174.8	29.6	90.8	2.0	0.0	0.7	10.90
57	MT030107	147.3	49.6	14.2	174.4	30.9	94.5	1.7	0.7	0.3	11.67
12	Conrad	146.7	50.3	14.7	173.8	32.7	96.4	2.0	0.7	0.0	12.17
21	MT910189	146.5	48.3	14.0	171.9	35.7	91.9	2.7	0.0	1.7	11.10
62	MT030168	145.5	50.2	14.6	175.5	34.3	90.4	1.7	0.0	0.0	12.13
60	MT030152	144.7	51.2	13.5	175.2	35.5	95.8	2.7	0.0	0.7	11.00
26	MT000040	144.4	51.9	14.2	173.5	33.6	98.1	2.3	0.0	0.0	12.59
51	MT030047	144.4	51.3	13.5	174.6	31.0	97.3	2.7	0.7	0.3	10.01
36	MT010212	144.1	51.1	13.8	174.4	33.5	96.8	2.3	0.0	1.0	11.20
28	MT000125	143.4	51.6	13.6	173.8	35.4	96.2	2.7	1.0	1.3	11.04
41	MT020166	143.3	50.6	13.8	173.1	32.6	95.3	2.3	0.7	0.0	10.60
25	MT981210	143.0	51.6	13.8	174.0	32.4	96.6	2.3	0.0	0.3	12.21
58	MT030137	142.8	51.0	14.2	173.4	31.4	95.4	2.0	0.0	1.0	12.15
4	Baronesse	142.7	50.1	14.8	174.3	31.2	96.8	2.7	0.0	0.0	11.54
42	MT020167	142.2	51.8	14.5	174.0	33.9	97.4	2.3	0.0	0.0	10.75
46	MT030035	141.6	50.2	13.7	174.5	33.6	94.9	2.0	0.0	0.7	10.26
63	MT030173	141.1	50.9	14.8	175.7	33.0	95.9	2.0	0.0	0.3	11.84
27	MT000047	141.0	50.6	13.7	173.5	35.8	92.9	2.3	0.0	0.0	11.37
18	P952R522	140.1	51.4	14.3	173.6	33.8	93.3	2.3	1.3	0.3	10.51
64	MT030188	139.7	51.0	13.9	173.2	35.6	97.1	2.7	0.0	1.0	11.53
45	MT030003	138.0	50.8	13.3	171.9	33.2	97.4	3.3	0.0	0.0	11.39
33	MT010160	137.8	52.0	14.1	174.2	35.7	96.6	2.3	0.0	0.0	11.54
52	MT030051	137.6	50.6	14.2	172.8	35.0	94.7	2.0	0.0	0.7	12.26
43	MT020204	137.6	51.0	14.1	173.1	34.2	93.8	2.3	0.0	1.3	11.22
13	Legacy	137.4	46.5	13.0	174.8	38.5	90.4	2.3	0.0	2.0	10.57
19	Marthe	137.4	48.7	13.8	181.3	33.1	95.0	2.7	0.0	0.3	11.23

Table 1 (Continued). Agronomic data from the Intrastate Spring Barley Nursery grown at the Northwestern Agricultural Research Center Kalispell, MT.

Planted: April 20, 2005 Harvested: August 23, 2005

Entry	Cultivar	Yield	Test weight	Grain moisture	heading date	Plant height	Plump	Net blotch	Scald	Stripe rust	Protein
								7/26/2005			
		bu/ac	lb/bu	%	Julian	in	%	0-4	0-3	0-3	%
7	Calgary		50.2	14.2	175.0	27.4	93.0	2.3	0.0	0.0	11.83
30	MT010080	136.5	51.3	14.4	172.8	35.6	96.2	2.7	1.0	0.0	11.88
14	Tradition	136.1	47.5	13.0	172.9	39.4	96.2	1.3	0.0	2.0	10.95
24	MT970229	136.1	51.3	15.1	175.2	33.3	97.7	2.3	1.0	0.0	11.76
29	MT000138	135.7	52.8	14.2	172.4	36.2	98.3	2.3	0.0	0.3	13.25
37	MT010213	135.4	51.3	15.6	174.9	30.8	96.0	2.7	0.0	1.7	12.62
49	MT030042	135.1	49.6	13.7	172.1	30.4	87.2	3.0	0.7	0.7	11.09
23	MT970116	134.9	52.2	14.2	172.8	38.7	95.5	2.7	0.0	0.7	10.94
54	MT030079	134.8	50.9	14.2	174.8	35.2	91.1	3.3	1.0	1.7	10.71
53	MT030063	134.6	52.0	14.6	175.2	36.7	98.2	2.0	0.0	1.0	11.40
15	Morex	134.0	48.0	12.8	172.1	41.6	91.8	3.0	0.0	0.7	12.95
8	Valier	133.9	51.7	15.5	177.9	35.4	97.2	1.7	0.0	0.3	11.88
39	MT020155	133.1	49.4	13.7	171.0	35.2	92.1	3.3	0.0	1.7	10.96
56	MT030093	132.4	50.3	14.4	175.4	31.2	95.6	2.0	0.7	0.7	10.98
44	MT020205	132.1	50.8	14.1	172.9	34.1	95.1	2.0	0.0	0.3	11.79
32	MT010158	131.8	51.3	14.1	173.4	32.8	96.2	3.0	1.0	0.3	12.43
50	MT030046	131.0	51.3	15.0	173.8	33.4	96.0	1.7	0.7	0.0	11.90
2	Gallatin	130.4	50.9	14.3	174.0	35.2	92.9	3.0	0.0	0.0	11.44
34	MT010162	130.1	51.8	14.3	175.3	33.1	95.4	1.7	0.7	0.0	11.33
59	MT030144	129.6	50.0	14.4	173.0	32.4	95.0	1.3	1.7	0.0	12.46
16	YU587432	129.3	50.1	14.2	172.8	32.9	95.6	3.0	0.0	0.3	11.23
1	Haxby	128.5	52.0	15.0	174.9	35.6	97.1	3.0	0.7	0.3	10.85
48	MT030039	128.4	50.5	14.2	170.1	30.4	94.0	2.7	0.0	0.0	11.27
47	MT030036	128.0	50.7	14.4	174.0	32.5	97.4	1.7	1.0	2.0	10.82
38	MT020064	127.7	52.7	14.2	173.5	33.7	98.5	2.7	0.0	0.0	11.41
10	Harrington	127.2	49.2	14.2	175.4	33.8	93.5	2.3	0.0	0.3	10.71
6	Boulder	127.0	50.4	15.0	174.6	31.7	96.8	3.0	0.7	0.7	12.02
20	Shakira	119.7	48.5	13.8	177.5	26.8	95.6	3.0	0.0	0.0	10.85
9	Hays	118.6	44.8	14.0	176.0	32.2	85.7	2.0	0.0	0.3	10.89
	Mean	**138.5**	**50.6**	**14.2**	**174.3**	**33.9**	**95.0**	**2.4**	**0.3**	**0.6**	**11.42**
	CV (%)	**6.45**			**0.55**	**7.00**		**26.50**	**274**	**133**	
	LSD(0.05)	**12.27**			**1.51**	**3.52**		**1.00**	**1.27**	**1.21**	

Project Title: Agronomic Performance Evaluation of Advanced Spring Wheat Experimental Lines.

Project Leader: Bob Stougaard

Project Personnel: Qingwu Xue, Fernando Guillen, Luther Talbert, and Susan Lanning

Objectives:

To evaluate advanced spring wheat experimental lines for agronomic performance and disease resistance in environments and cropping systems representative of northwestern Montana.

Results:

Temperature was near normal but precipitation was higher than average, particularly in June with a total of 8 inches. As a result, grain filling was longer than normal and maturity was correspondingly delayed. The wet conditions also resulted in moderate to severe stripe rust infestations in several entries, resulting in reduced yields. Yields ranged from 104.4 bu/ac (MT 0249) to 38 bu/ac (MT 0432) with an average of 71.5 bu/ac, which was lower than 2004 (93.2 bu/ac). Grain test weight (average 58 lb/bu) was also lower than the previous season (61 lb/bu) and ranged from 50.0 to 62.9 lb/bu. The low test weight was also attributed to stripe rust. Heading date ranged from Julian 171 to 180, generally one week later than previous year. Plant height was normal and averaged 33.5 inches. Grain protein averaged 12.6%, which was lower than the previous season (14.7%).

Summary:

While yields, test weights, and protein were poor, 2005 was ideal for evaluating disease infestations in spring wheat. The top yielding entries were generally resistant to stripe rust. MT 0249, MT 0476, MT 0413, BZ9M1024 and WPB Germany were the high yield entries (>95 bu/ac).

Future Plans:

Continue spring wheat evaluations for the purpose of identifying cultivars best suited for District 1.

Table 1. Agronomic data from the Advanced Spring Wheat Nursery grown at the Northwestern Agricultural Research Center Kalispell, MT.

Planted: April 20, 2005 Harvested: August 26, 2005

Entry	Cultivar	Yield	Test weight	Grain moisture	Heading date	Plant height	Stripe rust 7/8/05	Protein
		bu/ac	lb/bu	%	Julian	in	%	%
15	MT 0249	104.4	59.5	14.3	174.0	33.3	5.7	13.4
49	MT 0476	101.1	58.0	14.5	177.3	34.9	3.3	11.7
32	MT 0413	100.8	60.8	15.0	174.3	34.1	1.7	12.5
54	BZ9M1024	97.4	60.3	14.7	175.0	33.6	5.0	12.1
53	WPB GERMANY	95.2	61.9	15.2	178.7	32.8	1.7	11.4
34	MT 0415	94.1	60.0	14.5	175.7	37.7	6.7	14.0
28	MT 0408	93.5	59.6	15.6	179.0	37.5	8.3	12.5
6	Reeder	92.4	59.0	14.6	174.3	35.4	10.0	13.5
35	MT 0416	90.7	59.5	14.7	175.3	32.7	33.3	11.9
64	BZ998447	90.5	58.9	14.7	173.0	33.2	6.7	11.2
33	MT 0414	90.1	59.6	15.5	175.7	36.1	8.3	14.3
56	FREYR	84.3	60.0	15.7	175.3	33.6	5.0	12.8
16	MT 0260	83.0	58.7	15.7	177.3	36.5	30.0	12.7
17	MT 0266	82.8	56.7	13.3	173.3	33.8	10.0	12.5
47	MT 0464	82.7	60.9	14.5	172.0	33.2	15.0	11.2
59	BUCK PRONTO	82.4	60.1	14.3	171.7	32.7	6.7	12.0
5	SCHOLAR	82.2	60.2	14.2	178.0	39.3	5.0	13.1
30	MT 0411	81.8	58.2	14.0	172.7	30.4	5.0	12.3
13	ALSEN	81.6	60.3	15.5	174.3	32.4	0.0	13.7
7	Conan	81.3	59.4	16.1	175.0	33.5	3.3	13.0
44	MT 0459	80.5	62.9	15.4	175.3	38.2	8.3	12.6
61	MTHW0202	80.2	59.7	13.4	172.0	31.4	6.7	12.1
27	MT 0405	79.8	59.8	13.9	174.3	32.3	15.0	12.3
26	MT 0401	79.0	59.0	14.0	174.0	32.9	6.7	13.8
12	KNUDSON	77.9	57.5	15.0	176.3	32.7	13.3	11.5
37	MT 0418	76.7	59.8	13.8	172.7	33.8	30.0	12.8
52	TRIPLE IV	75.6	58.4	13.2	172.3	32.1	5.0	11.1
24	MT 0342	75.3	59.5	14.0	175.0	33.5	16.7	11.7
31	MT 0412	75.2	57.1	13.9	173.0	32.2	26.7	12.6
2	FORTUNA	74.8	61.3	14.6	176.0	38.9	8.3	12.0
48	MT 0465	74.5	61.5	14.4	174.0	32.6	6.7	12.6
57	AGRIPRO5	72.4	60.6	14.7	175.3	36.1	46.7	11.0
14	MT 0245	72.4	56.1	14.8	176.3	33.9	10.0	14.0
8	HANK	71.5	55.7	13.4	175.3	31.1	8.3	12.4
10	CHOTEAU	71.3	58.1	15.0	175.7	30.7	11.7	13.2

Table 1 (Continued). Agronomic data from the Advanced Spring Wheat Nursery grown at the Northwestern Agricultural Research Center Kalispell, MT.

Planted: April 20, 2005 Harvested: August 26, 2005

Entry	Cultivar	Yield	Test weight	Grain moisture	Heading date	Plant height	Stripe rust 7/8/05	Protein
		bu/ac	lb/bu	%	Julian	in	%	%
58	BANTON	71.0	61.3	14.5	173.0	30.3	18.3	13.6
36	MT 0417	68.6	57.1	14.3	172.3	32.7	18.3	12.8
19	MT 0315	68.1	58.2	14.4	176.7	35.4	46.7	13.6
60	EXPLORER	67.7	57.8	13.8	172.3	31.0	11.7	13.1
22	MT 0325	67.1	59.8	14.7	175.3	34.1	13.3	12.9
62	MTHW0471	66.5	60.6	15.4	180.3	36.9	40.0	12.3
63	AGAWAM	66.1	61.4	15.0	172.3	29.8	8.3	10.8
50	SX1504B	65.3	57.7	13.6	178.0	27.6	8.3	11.8
51	BZ992592	64.7	57.5	13.9	176.3	33.3	6.7	12.2
23	MT 0336	63.5	57.4	13.9	174.7	35.8	53.3	12.3
4	ERNEST	61.8	57.8	14.8	176.7	38.7	40.0	12.9
18	MT 0313	61.5	58.8	13.9	176.3	35.9	30.0	13.0
46	MT 0461	61.3	58.3	15.0	178.0	37.4	40.0	12.7
55	BZ9M1044	61.2	58.7	13.7	174.3	27.4	11.7	12.1
9	OUTLOOK	61.0	54.8	13.1	179.0	32.4	13.3	12.1
11	NORPRO	59.0	52.2	11.2	176.0	30.7	36.7	13.0
29	MT 0410	57.2	55.0	14.1	176.3	36.3	46.7	13.0
40	MT 0425	56.3	51.7	12.7	173.3	32.4	60.0	12.7
25	MT 0345	54.2	55.6	13.1	177.3	30.9	46.7	13.1
20	MT 0318	49.0	56.3	13.4	175.3	31.9	56.7	13.8
21	MT 0319	48.1	56.9	13.3	175.7	33.3	63.3	13.6
1	THATCHER	48.0	58.5	14.7	180.3	43.2	46.7	11.8
45	MT 0460	46.8	54.6	13.2	176.0	35.1	56.7	11.4
38	MT 0421	46.3	52.9	13.0	176.7	30.1	50.0	12.8
3	MCNEAL	43.6	51.9	12.0	176.7	31.0	43.3	12.9
39	MT 0423	43.5	52.7	13.0	172.7	30.7	80.0	13.4
43	MT 0433	41.4	50.0	12.7	173.3	30.5	76.7	12.7
41	MT 0431	40.2	53.6	14.0	171.3	26.4	70.0	13.0
42	MT 0432	38.0	53.1	13.0	176.0	31.8	70.0	13.1
	Mean	71.5	58.0	14.2	175.2	33.5	24.3	12.6
	CV (%)	7.7			0.4	5.4	33.7	
	LSD (0.05)	8.46			1.08	2.72	12.73	

FORAGE INVESTIGATION

759

Forage investigation is part of Project 759 and includes research related to all types of forage from seeding to data collection to publications

PROJECT TITLE: **2001 IRRIGATED INTRASTATE ALFALFA YIELD TRIAL**

PROJECT COOPERATORS: Dennis Cash, MSU – Bozeman
Duane Johnson, MSU – NWARC
Louise Strang, MSU - NWARC

OBJECTIVE: Compare yield potential of new releases and experimental lines with older, established cultivars in an irrigated/high rainfall environment.

METHODS: The experiment was established on 5/3/01. Nineteen cultivars were seeded in 5-ft by 15-ft plots consisting of 7 rows spaced 6-inches apart. Seeding rate was 8 lbs/acre pure live seed, and seeding depth was 0.5 in. Monoammonium phosphate fertilizer *(*11-52-0*)* was applied preplant at a rate of 400 lbs/acre and at 120 lbs/acre each spring following. The experimental design was a randomized complete block with 19 cultivars and four replications.

Crop year precipitation was 21.88 inches. Average monthly temperatures were 43.9, 51.8, 55.3, 62.6, and 62.8 degrees F from April to August, respectively.

Forage yield harvest dates were 6/24, and 8/4/05. The trial was terminated after the second harvest.

Plots were harvested with a sickle-bar research plot swather. Harvest area was 75 ft^2. After recording the fresh harvest weight, a subsample of approximately 500 g was taken, weighed, dried at 60°C in a forced air oven for 48 to 72 h, and reweighed to determine DM content.

Analysis of variance was calculated by the ANOVA procedure of XLSTAT Ver.7.5 (2004). Critical value for a significant F-test was tested at P=0.05. Treatment effects were compared using protected LSD when the F test for treatment was significant.

RESULTS: The highest yielding cultivars in 2005 were 'Ladak 65', 'Plumas', 'Amerstand 403T', 'Mariner II', 'Reliance', 'Monument II', 'Ascend 552', 'Abound', 'Alliant', and 'DK A42-15'.

Over the 5 years of the study, Alliant was the most productive (27.23 t/a), and 'Wrangler' was least productive (20.62 t/a).

A summary of the 2005 data is presented on the next page.

2005 Summary of the 2001 Irrigated Intrastate Alfalfa Yield Trial At Kalispell

Variety	MTNO	2002 Total Yield	2003 Total Yield	2004 Total Yield	2005 Total Yield	2002-05 Total Yield	% of Mean
Ladak 65	2	8.39	6.13	6.28	**3.20**	24.01	94.2
Riley	122	**7.92**	**7.47**	7.20	2.88	**25.47**	99.9
Wrangler	146	8.11	6.40	6.11	2.69	23.30	91.4
Shaw	328	**9.11**	**6.30**	6.42	3.00	**25.34**	99.4
Cooper	335	**9.61**	7.27	6.72	2.86	**26.19**	102.7
Plumas	336	**9.33**	6.70	6.13	**3.20**	25.04	98.2
Amerstand 403T	372	**9.00**	6.65	6.14	**3.22**	24.98	98.0
Goliath	373	**8.97**	7.23	6.66	3.11	**26.02**	102.0
Mariner II	374	**9.03**	7.02	6.45	**3.20**	**26.12**	102.4
Reliance	375	**9.46**	6.94	6.09	**3.68**	**25.82**	101.3
Monument II	376	**8.82**	**7.22**	6.25	**3.27**	**25.56**	100.2
DAK 9901	377	**8.68**	7.09	6.71	2.99	**25.48**	99.9
Ascend 552	378	**8.63**	7.34	6.51	**3.35**	**25.82**	101.3
Abound	379	**8.75**	6.85	6.02	**3.42**	25.05	98.2
Alliant	380	**9.30**	7.69	6.90	**3.34**	**27.23**	106.8
DK A42-15	381	**10.27**	6.85	6.25	**3.65**	**27.02**	106.0
A 30-06	382	8.63	6.68	6.47	3.07	24.86	97.5
WL 327	383	9.28	6.88	5.92	3.15	25.23	98.9
WBRR	384	**9.13**	7.16	6.80	2.93	**26.02**	102.0
mean		8.97	6.94	6.42	3.17	25.50	
LSD(0.05)		0.90	0.72	0.83	0.53	1.93	
Pr > F		7.076	0.005	0.101	0.036	< 0.0001	
CV(%mean)		7.1	7.3	9.1	11.8		

Yield values in **bold** are not significantly different (P=0.05) from the highest yield in the same column.

PROJECT TITLE: **2002 DRYLAND INTRASTATE ALFALFA YIELD TRIAL**

PROJECT COOPERATORS: Dennis Cash, MSU – Bozeman
Duane Johnson, MSU – NWARC
Louise Strang, MSU - NWARC

OBJECTIVE: Compare yield potential of new releases and experimental lines with older, established cultivars.

METHODS: The experiment was established on 5/8/02. Fourteen cultivars were seeded in 5-ft by 20-ft plots consisting of 7 rows spaced 6-inches apart. Seeding rate was 5 lbs/acre pure live seed, and seeding depth was 0.5 in. Mono-ammonium phosphate fertilizer *(*11-52-0*)* was applied preplant at a rate of 400 lbs/acre and at 120 lbs/acre each spring following. The experimental design was a randomized complete block with 14 cultivars and four replications.

Crop year precipitation was 21.88 inches. Average monthly temperatures were 43.9, 51.8, 55.3, 62.6, and 62.8 degrees F from April to August, respectively.

Forage yield harvest dates were 6/23, 8/2, and 10/5/05. Plots were harvested with a sickle-bar research plot swather. Harvest area was 100 ft^2. After recording the fresh harvest weight, a subsample of approximately 500 g was taken, weighed, dried at 60°C in a forced air oven for 48 to 72 h, and reweighed to determine DM content.

Analysis of variance was calculated by the ANOVA procedure of XLSTAT Ver.7.5 (2004). Critical value for a significant F-test was tested at P=0.05. Treatment effects were compared by protected LSD when the F test for treatment was significant.

RESULTS: The highest yields for 2005 included 'Plumas', 'HybriForce 400', 'HybriForce 420', 'XTRA-3', '6420', 'Rebel', 'Rugged', and 'WL319HQ'. Over the 3 years of the study, 'HybriForce 400' was most productive (13.14 t/a), and Ameristand 403T was least productive (8.70 t/a).

2005 Summary table is presented on the next page.

2005 Summary of the 2002 DRYLAND INTRASTATE ALFALFA YIELD TRIAL

Cultivar	Harvest-1	Harvest-2	Harvest-3	2005 Total	2004 Total	2003 Total	2003-05 Total	%Mean
	t/a	*t/a*	*t/a*	*t/a*	*t/a*	*t/a*	*t/a*	
HybriForce 400	1.79	1.64	0.85	4.28	**5.34**	**3.52**	13.14	118.6
HybriForce-420/Wet	1.73	1.62	0.70	4.05	**4.91**	**3.07**	12.04	108.6
6420	1.49	1.63	0.77	3.89	**5.07**	**3.00**	11.96	108.0
WL 319HQ	1.73	1.44	0.67	3.84	**4.84**	**3.12**	11.80	106.5
Ladak DL	1.32	1.53	0.62	3.47	**4.89**	**3.08**	11.43	103.2
Plumas	1.56	1.43	0.65	3.64	**4.61**	**3.14**	11.39	102.8
Rugged	1.67	1.49	0.60	3.76	**4.52**	**3.07**	11.35	102.4
Wrangler	1.32	1.34	0.55	3.21	**4.79**	**3.25**	11.25	101.5
Rebel	1.54	1.47	0.66	3.67	**4.28**	**2.93**	10.87	98.1
XTRA-3	1.45	1.48	0.55	3.48	**4.29**	2.85	10.62	95.8
Cooper	1.33	1.45	0.59	3.37	**4.23**	**2.94**	10.54	95.1
Shaw	1.36	1.34	0.53	3.23	**4.25**	**3.03**	10.51	94.8
Ladak 65	1.06	1.28	0.38	2.72	**4.18**	2.65	9.54	86.1
Ameristand 403T	0.97	1.41	0.54	2.93	3.39	2.38	8.70	78.5
mean	1.45	1.47	0.62	3.54	4.54	3.00	11.08	
LSD(0.05)	0.47	0.34	0.06	0.81	1.38	0.63	3.49	
Pr>F	0.642	0.653	0.174	0.603	0.00	0.00	0.660	
CV(%mean)	22.8	16.5	6.7	16.2	21.3	20.1	22.2	

Planting date: 5/8/02

Fertilizer: 22 lbs N/a + 104 lbs P_2O_5/a - 4/15/05

PROJECT TITLE: **2002 IRRIGATED INTRASTATE ALFALFA YIELD TRIAL**

PROJECT COOPERATORS: Dennis Cash, MSU – Bozeman
Duane Johnson, MSU – NWARC
Louise Strang, MSU - NWARC

OBJECTIVE: Compare yield potential of new releases and experimental lines with older, established cultivars in an irrigated/high rainfall environment.

METHODS: The experiment was established on 5/8/02. Fourteen cultivars were seeded in 5-ft by 20-ft plots consisting of 7 rows spaced 6-inches apart. Seeding rate was 8 lbs/acre pure live seed, and seeding depth was 0.5 in. Monoammonium phosphate fertilizer (11-52-0) was applied preplant at a rate of 400 lbs/acre and at 120 lbs/acre each spring following. The experimental design was a randomized complete block with 14 cultivars and four replications.

Crop year precipitation was 21.88 inches. Average monthly temperatures were 43.9, 51.8, 55.3, 62.6, and 62.8 degrees F from April to August, respectively.

Forage yield harvest dates were 6/24, 8/5, and 10/10/05. Plots were harvested with a sickle-bar research plot swather. Harvest area was 100 ft^2. After recording the fresh harvest weight, a subsample of approximately 500 g was taken, weighed, dried at 60°C in a forced air oven for 48 to 72 h, and reweighed to determine DM content.

Analysis of variance was calculated by the ANOVA procedure of XLSTAT Ver.7.5 (2004). Critical value for a significant F-test was tested at P=0.05. Treatment effects were compared by protected LSD when the F test for treatment was significant.

RESULTS: There were no significant differences in yield among eleven of the 14 varieties tested. Over the 3 years of the study, 'Cooper', 'Plumas', and 'HybriForce 420/Wet' were the most productive (>16.7 t/a), and 'Ladak DL' was least productive (15.0 t/a).

See the summary table on the next page.

2005 Summary of the 2002 IRRIGATED INTRASTATE ALFALFA YIELD TRIAL

Cultivar	*H-1* Yield	*H-2* Yield	*H-3*	2005 Total Yield	2004 Total Yield	2003 Total Yield	2003-05 Total Yield	%Mean
			tons DM/acre					
Cooper	1.69	**1.77**	**0.87**	**4.33**	6.75	5.82	**16.89**	105
Plumas	1.74	**1.75**	0.81	**4.30**	6.55	5.99	**16.84**	105
HybriForce-420/Wet	1.45	**1.79**	**1.00**	**4.24**	6.57	5.96	**16.77**	104
Ameristand 403T	1.67	**1.73**	0.81	**4.21**	6.31	5.61	**16.13**	100
XTRA-3	1.64	**1.67**	**0.86**	**4.18**	6.43	5.79	**16.40**	102
WL 319HQ	1.60	**1.73**	0.74	**4.08**	6.64	5.69	**16.41**	102
Rugged	1.60	**1.69**	0.78	**4.07**	6.37	5.58	**16.01**	100
Shaw	1.55	**1.66**	0.81	**4.01**	6.50	5.82	**16.34**	102
Rebel	1.52	**1.61**	**0.85**	**3.97**	6.31	5.73	**16.01**	100
Ladak 65	1.75	**1.66**	0.54	**3.96**	6.13	5.32	15.40	96
6420	1.48	**1.62**	**0.85**	**3.96**	6.37	5.91	**16.24**	101
Wrangler	1.48	1.53	0.74	3.76	6.09	5.28	15.13	94
Ladak DL	1.52	1.55	0.70	3.76	5.86	5.39	15.01	93
HybriForce 400	1.30	1.53	**0.89**	3.73	6.11	5.59	15.42	96
mean	1.57	1.66	0.80	4.04	6.36	5.68	16.07	
LSD(0.05)	NS	0.20	0.17	0.55	NS	NS	1.22	
Pr>F	0.209	0.016	0.000	0.047	0.228	0.375	0.000	
CV(%mean)	14.5	8.4	14.5	9.5	2.8	7.6	5.3	

Yield values in **bold** are not significantly different (P=0.05) from the highest yield in the same column.

Seeded 5/8/02

Fertilizer: 13 lbs N + 62 lbs P_2O_5 - 4/15/05

Herbicide: 2,4-D + Banvel - 5/10/05

PROJECT TITLE: **2004 DRYLAND INTRASTATE ALFALFA YIELD TRIAL**

PROJECT COOPERATORS: Dennis Cash, MSU – Bozeman
Duane Johnson, MSU – NWARC
Louise Strang, MSU - NWARC

OBJECTIVE: Compare yield potential of new releases and experimental lines with older, established cultivars under non-irrigated conditions.

METHODS: The trial was seeded on 4/22/04. Thirteen cultivars were seeded in 5-ft by 20-ft plots consisting of 7 rows spaced 6-inches apart. Seeding rate was 9 lbs/acre pure live seed, and seeding depth was 0.5 in. Mono-ammonium phosphate fertilizer (11-52-0) was applied preplant at a rate of 120 lbs/acre. Pursuit (3 oz./a) and Prowl (1.8 pt/a) were preplant incorporated for weed control. The experimental design was a randomized complete block with 13 cultivars and four replications.

Crop year precipitation was 21.88 inches. Average monthly temperatures were 43.9, 51.8, 55.3, 62.6, and 62.8 degrees F from April to August, respectively.

Forage yield harvest dates were 6/23, 8/2, and 9/28/05. Plots were harvested with a sickle-bar research plot swather. Harvest area was 100 ft^2. After recording the fresh harvest weight, a subsample of approximately 500 g was taken, weighed, dried at 60°C in a forced air oven for 48 to 72 h, and reweighed to determine DM content.

Analysis of variance was calculated by the ANOVA procedure of XLSTAT Ver.7.5 (2004). Critical value for a significant F-test was tested at P=0.05. Treatment effects were compared by protected LSD when the F test for treatment was significant.

RESULTS: The total yields for 2005 were statistically similar except for '6400HT' which produced the most forage.

A table summarizing the 2004 trials is presented on the next page.

2005 Summary of the
2004 DRYLAND INTRASTATE ALFALFA YIELD TRIAL

Cultivar	Harvest-1	Harvest-2	Harvest-3	2005 Total	%Mean	2004 Total
	t/a	t/a	t/a	t/a		t/a
6400HT	1.35	1.30	0.76	**3.58**	1.07	1.55
54Q25	1.19	1.42	0.86	3.47	1.04	1.72
Lightening Xtra	1.27	1.38	0.79	3.44	1.03	1.53
VL02	1.19	1.30	0.89	3.38	1.01	1.64
MT-9321	1.25	1.33	0.79	3.37	1.01	1.68
DKA 33-16	1.21	1.28	0.85	3.34	1.00	1.65
Ladak 65	1.21	1.31	0.81	3.33	1.00	1.80
Cooper	1.17	1.28	0.88	3.32	1.00	1.79
DKA 50-18	1.22	1.35	0.75	3.31	0.99	1.59
Shaw	1.32	1.26	0.69	3.27	0.98	1.75
Boulder	1.11	1.22	0.89	3.22	0.96	1.74
MT-2003-1	1.17	1.26	0.78	3.22	0.96	1.63
Rebound 5.0	1.26	1.28	0.67	3.21	0.96	1.48
mean	1.22	1.30	0.80	3.34		1.66
LSD(0.05)	NS	NS	NS	0.02		0.26
Pr>F	0.543	0.091	0.526	0.029		
CV(%mean)	10.0	1.1	15.7	0.3		

Planting date: 4/22/04
Harv-1: 6/23/05 - pbl
Harv-2: 8/2/05 - mbl
Harv-3: 9/27/05 - v

Fertilizer: 22 lbs N/a + 104 lbs P_2O_5/a - 4/15/05

PROJECT TITLE: **2004 IRRIGATED INTRASTATE ALFALFA YIELD TRIAL**

PROJECT COOPERATORS: Dennis Cash, MSU – Bozeman
Duane Johnson, MSU – NWARC
Louise Strang, MSU - NWARC

OBJECTIVE: Compare yield potential of new releases and experimental lines with older, established cultivars under irrigated conditions.

METHODS: The trial was seeded on 4/23/04. Thirteen cultivars were seeded in 5-ft by 20-ft plots consisting of 7 rows spaced 6-inches apart. Seeding rate was 9 lbs/acre pure live seed, and seeding depth was 0.5 in. Mono-ammonium phosphate fertilizer (11-52-0) was applied preplant at a rate of 120 lbs/acre. Pursuit (3 oz./a) and Prowl (1.8 pt/a) were preplant incorporated for weed control. The experimental design was a randomized complete block with 13 cultivars and four replications.

Crop year precipitation was 21.88 inches. Average monthly temperatures were 43.9, 51.8, 55.3, 62.6, and 62.8 degrees F from April to August, respectively.

Forage yield harvest dates were 7/1, 8/5, and 10/10/05. Plots were harvested with a sickle-bar research plot swather. Harvest area was 100 ft^2. After recording the fresh harvest weight, a subsample of approximately 500 g was taken, weighed, dried at 60°C in a forced air oven for 48 to 72 h, and reweighed to determine DM content.

Analysis of variance was calculated by the ANOVA procedure of XLSTAT Ver.7.5 (2004). Critical value for a significant F-test was tested at P=0.05. Treatment effects were compared by protected LSD when the F test for treatment was significant.

RESULTS: The total yields for 2005 ranged from 3.41 t/a ('Rebound 5.0') to 3.94 t/a ('Lightening Xtra'). A table is presented on the next page.

2004 INTRASTATE ALFALFA YIELD TRIAL - Irrigated

Kalispell, 2005

		Total Dry Matter Yield			2005		2004
		Harv-1	Harv-2	Harv-3	Total	%Mean	Total
Variety	MTNO	*t/a*	*t/a*	*t/a*	*t/a*		*t/a*
Lightening Xtra	394	1.70	1.54	0.70	**3.94**	108.9	3.16
Boulder	397	1.59	1.60	0.70	**3.89**	107.4	2.89
Shaw	328	1.67	1.48	0.58	**3.74**	103.3	3.08
VL02	392	1.65	1.33	0.71	**3.69**	101.9	2.83
Cooper	335	1.62	1.49	0.54	**3.65**	100.7	3.19
MT-9321	333	1.72	1.42	0.48	**3.62**	100.1	3.11
DKA 50-18	396	1.51	1.35	0.74	**3.60**	99.4	2.76
54Q25	393	1.62	1.36	0.61	**3.59**	99.2	3.06
MT-2003-1	400	1.54	1.35	0.67	3.56	98.4	2.93
Ladak 65	2	1.75	1.37	0.38	3.49	96.5	2.98
DKA 33-16	395	1.46	1.40	0.60	3.45	95.3	2.68
6400HT	399	1.56	1.40	0.48	3.45	95.3	2.76
Rebound 5.0	398	1.46	1.33	0.62	3.41	94.2	2.95
mean		1.60	1.42	0.60	3.62		2.95
LSD(0.05)		0.11	0.25	0.17	0.38		0.46
Pr>F		0.380	0.723	0.578	0.015		0.44
CV(%mean)		5.0	12.3	20.4	7.4		10.9

Seeded 4/23/04

Harv-1: 7/1/05 -ebl

Harv-2: 8/5/05 - mbl

Harv-3: 10/10/05

Fertilizer: 22 lbs N/a + 104 lbs P_2O_5/a - 4/15/05

PROJECT TITLE: **Irrigated Forage Grasses**

PROJECT COOPERATORS: Dennis Cash, MSU-Bozeman
Duane Johnson, MSU-NWARC
Louise Strang, MSU-NWARC

OBJECTIVE: Compare yield potential and stand persistence of different species and varieties of cool-season forage grasses in a northwestern Montana high moisture environment.

METHODS: The experiment was established at the Northwestern Agricultural Research Center, Kalispell, MT. The soil at this site is a Creston silt loam (coarse silty, mixed Pachic Haploxeroll, 37 g/kg organic C, pH 7.9). Thirty-two cultivars from 14 species of perennial grasses were seeded in 5' by 15' plots consisting of 4 rows spaced 12" apart. The plots were fertilized with 13 lbs N/a + 62 lbs P_2O_5/a on 3/30/04. The experimental design was a randomized complete block four replications. Spot spraying with 2,4-D + Banvel on 5/18/05 controlled broadleaf weeds.

Precipitation from March through August totaled 14.7". Average monthly temperatures were 43.9, 51.8, 55.3, 62.6, and 62.8 degrees F from April to August, respectively.

Harvest dates were 6/22 and 9/6/05. Plots were harvested with a sickle-bar research plot swather. Harvest area was 75 ft^2. After recording the fresh harvest weight, a sub sample of approximately 500 g was taken from 2 plots of each species, weighed, dried at 60°C in a forced air oven for 48 to 72 h, and reweighed to determine DM content.

Analysis of variance was calculated by the ANOVA procedure of XLSTAT, Version 7.0. Critical value for a significant F-test was tested at P=0.05. Forage yield differences were compared by protected LSD when the F test for cultivars was significant.

DISCUSSION: Spring rain was beneficial for the early season production, but late season regrowth was retarded. Only the bluestems produced more second cutting forage than in their first harvest. The trial was terminated after the second harvest

The tall fescues (*Festuca arundinacea)*, Festulolium (*Lolium x Festuca pratense),* and 'Intensiv' orchard grass (*Dactylis glomerata* L.) were the most productive in 2005 (>3.0 t/a). Over the past 4 years, these tall fescues, 'Hykor' Festulolium (a perennial rye X meadow fescue hybrid), and 'Mb-1' produced 16.5-18.6 tons of forage/acre. The least productive species were the bluegrasses (*Poa* spp.), Big Bluestem (*Andropogon geradii* Vitman), and Little Bluestem (*Schizachyrium scopanium*).

Irrigated Forage Grasses Summary

Cultivar	Species	Harv-1 t/a	Harv-2 t/a	2005 Total t/a	2004 Total t/a	2003 Total t/a	2002 Total t/a	2002-05 Total t/a	% of Mean
Fawn	orchardgrass	**2.63**	0.88	**3.51**	**2.75**	**5.05**	**7.30**	**18.61**	157.6
Forager	timothy	**2.23**	0.79	**3.02**	**2.44**	**5.04**	**6.62**	**17.12**	145.0
Hykor	orchardgrass	2.10	1.00	**3.10**	2.19	4.05	**7.39**	**16.72**	141.6
Mb-1	bromegrass, meadow	2.04	0.84	2.88	**2.48**	4.00	**7.23**	**16.59**	140.5
Martin 2	brome, smooth	**2.36**	0.76	**3.12**	**2.53**	**4.59**	**6.29**	**16.53**	140.0
Fleet	bromegrass, meadow	2.01	0.63	2.64	**2.61**	**4.54**	5.86	15.65	132.5
Paddock	brome, Alaska	1.81	0.77	2.59	**2.48**	4.22	5.64	14.93	126.4
Mb-2	brome, Alaska	1.94	0.78	2.73	**2.58**	3.99	5.16	14.47	122.5
Regar	brome, smooth	1.57	0.66	2.24	**2.41**	3.41	5.27	13.33	112.8
Intensiv	orchardgrass	**2.31**	1.00	**3.31**	2.10	3.11	3.86	12.39	104.9
Climax	orchardgrass	**2.41**	0.27	2.68	2.24	2.99	3.80	11.71	99.1
OG 9204	timothy	2.03	0.70	2.72	2.20	2.83	3.93	11.69	99.0
Hakari	fescue, tall	1.32	0.47	1.79	1.73	2.63	5.53	11.68	98.9
Magna	bromegrass, meadow	1.53	0.36	1.89	1.67	2.87	5.16	11.59	98.1
Mustang	timothy	1.52	0.45	1.97	1.54	1.37	**6.53**	11.41	96.6
Joliette	bluegrass, Kentucky	**2.26**	0.47	2.73	2.11	2.79	3.79	11.41	96.6
Manchar	bromegrass, meadow	1.71	0.61	2.33	1.71	2.82	4.43	11.29	95.6
Pauite	timothy	1.72	0.78	2.49	**2.34**	2.72	3.68	11.24	95.2
TM 9501	bluegrass, big	**2.22**	0.60	2.82	2.04	2.71	3.58	11.14	94.4
Bilbo	orchardgrass	**2.40**	0.28	2.69	2.08	2.85	3.53	11.14	94.3
Vega	timothy	**2.20**	0.24	2.44	2.01	2.96	3.70	11.11	94.1
Fure	perennial ryegrass	1.85	0.49	2.35	1.58	2.41	4.47	10.81	91.5
Blizzard	Festulolium	1.20	0.54	1.75	1.71	2.63	4.47	10.55	89.4
Potomac	fescue, meadow	1.68	0.67	2.35	2.11	2.63	3.38	10.47	88.7
Profile	timothy	1.49	0.71	2.20	2.12	2.59	3.23	10.14	85.9
Laura	fescue, meadow	1.81	0.46	2.26	1.53	2.32	3.84	9.95	84.2
Linn	perennial ryegrass	1.13	0.37	1.51	1.52	1.19	5.69	9.91	83.9
Park	bromegrass, meadow	1.07	0.31	1.37	1.35	1.94	4.32	8.99	76.1
Sherman	fescue, tall	0.78	0.52	1.30	**2.65**	1.52	1.35	6.81	57.7
Big Bluestem		0.00	**1.35**	1.35	**2.61**	1.83	0.61	6.39	54.1
Platini	fescue, tall	0.77	0.29	1.06	1.14	1.24	2.65	6.09	51.6
Little Bluestem	bluegrass, forage	0.00	0.90	0.90	**2.52**	2.12	0.55	6.09	51.5
	mean	1.69	0.62	2.31	2.10	2.95	4.46	11.81	
	LSD(0.05)	0.49	0.25	0.61	0.47	0.80	1.25	2.16	
	Pr > F	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.000	< 0.0001	

Seeded 5/3/01

Festulolium	*Lolium x Festuca pratense*
Big bluegrass	*Poa ampla* Merr.
Forage bluegra	*Poa pratensis* L.
Kentucky blueg	*Poa pratensis* L.
Alaska brome	*Bromus sitchiniis* Trin.
Smooth brome	*Bromus inermis* Leyss.
Meadow brome	*Bromus biebersteinii*
Meadow fescue	*Festuca pratense*
Tall fescue	*Festuca arundinacea*
Orchardgrass	*Dactylis glomerata* L.
Perennial ryegr	*Lolium perenne* L.
Timothy	*Phleum pratense*
Big bluestem	*Andropogon geradii* Vitman
Little bluestem	*Schizachyrium scopanium*

PROJECT TITLE: *Medicago falcata* Trial

PROJECT LEADER: Duane Johnson, NWARC
Res.Asst. - Louise Strang, NWARC

OBJECTIVE: Determine the performance of *M. falcata* in a forage legume/grass mixture.

METHODS: A *Medicago falcata* germplasm accession was seeded alone and in mixture with orchard grass (*Dactylis glomerata* L.) or meadow brome grass (*Bromus biebersteinii*) in a dry land nursery on 4/23/04. *M. sativa* cv. 'Shea' was included alone and in the same mixtures for comparison. The mixtures contained either 20% or 40% legume seed. The 2 alfalfas, 2 grasses, and 8 combinations were planted in 5' x 20' plots in a randomized complete block design with 4 replicates. The trial was harvested 6/27, 8/11, and 10/5/05. Subsamples from each species and mixture were weighed fresh and dry to determine dry matter content. Prior to drying, mixtures were separated into grass and legume components. Each component was weighed fresh then dried and weighed again to determine dry matter content.

Analysis of variance was calculated by the ANOVA procedure of XLSTAT Ver.7.5 (2004). Critical value for a significant F-test was tested at P=0.05. Treatment effects were compared by protected LSD when the F test for treatment was significant.

RESULTS: The *M. falcata* established poorly both alone and in the grass mixtures. The best total forage yields came from the 60% meadow brome/40% *M. sativa* mixture (6.75 t/a). Of the pure stands, *M. sativa* was most productive (5.16 t/a), followed by meadow brome grass (4.94 t/a). *M. falcata* produced the least (2.03 t/a).

M. falcata Trial

Kalispell, 2005

Species*	Harv-1			Harv-2			Harv-3	TotalYld	2004	2004-05
	alfalfa	grass	total	alfalfa	grass	total	total		Total	Total
	t/a	t/a	t/a	t/a	t/a	t/a	t/a	t/a	t/a	t/a
OG	0.40	1.79	2.19	0.06	**0.59**	0.66	0.14	2.99	0.42	3.41
MB	0.00	4.18	4.18	0.01	**0.64**	0.64	0.12	4.94	0.42	5.36
Falcata	**0.80**	0.58	1.38	0.32	0.23	0.55	0.10	2.03	0.25	2.28
Sativa	**1.68**	0.52	2.21	**2.14**	0.03	**2.17**	**0.79**	**5.16**	**1.39**	**6.55**
O80F20	**0.92**	1.54	2.47	0.10	**0.52**	0.62	0.09	3.18	0.61	3.78
O60F40	0.36	2.31	2.67	0.06	**0.44**	0.50	0.10	3.28	0.43	3.71
B80F20	0.00	4.27	4.27	0.14	**0.75**	0.88	0.16	**5.31**	0.39	5.71
B60F40	0.00	4.30	4.30	0.17	**0.38**	0.54	0.13	4.97	0.41	5.39
O80S20	**1.99**	0.64	2.63	1.17	**0.55**	**1.72**	0.35	4.70	0.76	5.46
O60S40	**1.57**	1.22	2.79	**1.72**	**0.43**	**2.15**	0.49	**5.44**	0.85	**6.29**
B80S20	**1.71**	7.03	4.09	1.05	**0.60**	**1.64**	0.43	**6.17**	**1.05**	**7.21**
B60S40	**1.33**	2.80	4.14	**1.71**	**0.46**	**2.17**	0.44	**6.75**	**1.04**	**7.79**
mean	0.90	2.60	3.11	0.72	0.47	1.19	0.28	4.58	0.67	5.24
LSD(0.05)	1.26	NS	NS	0.50	0.39	0.58	0.22	1.64	0.38	1.81
Pr>F	0.008	0.209	0.126	< 0.0001	0.0550	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
CV(%mean)	97.5	129.0	85.2	48.7	58.0	33.8	56.1	24.8	39.5	24.0

* OG, O – Orchard grass
MB, B – Meadow brome grass
F – *Medicago falcata*
S – *Medicago sativa*
Number after a letter - % seed planted

PROJECT TITLE: Spring Cereal Forage Trial

PROJECT COOPERATORS: Dave Wichman, MSU - CARC
Duane Johnson, MSU – NWARC
Louise Strang, MSU - NWARC

OBJECTIVE: To compare the yield and feeding quality of different species and cultivars of spring cereal crops as to their suitability as annual forage crops.

METHODS: Fertilizer was applied preplant at the following rates: 22 lbs/acre N, 104 lbs/a P_2O_5. 2,4-D and Banvel were applied post emergence for broadleaf weed control. Eighteen small grain selections were seeded 4/18/05 in a randomized complete block design with 3 replicates. Seeding rate was 21 seeds/ft^2. Plots were 5' wide x 15' long with 6" row spacing.

Crop year precipitation was 21.88 inches. Average monthly temperatures were 43.9, 51.8, 55.3, 62.6, and 62.8 degrees F from April to August, respectively. No irrigation was applied.

The forage was harvested when the heads had reached anthesis, 74 to 87 days after seeding, depending on species. Data collected included dry matter production, % nitrate, protein, ADF, and NDF.

Analysis of variance was calculated by the ANOVA procedure of XLSTAT Ver.7.5 (2004). Critical value for a significant F-test was tested at P=0.05. Treatment effects were compared by protected LSD when the F test for treatment was significant.

RESULTS: There were no significant yield differences among species and varieties in 2005. 'Red 1' triticale produced the most forage, followed by 'Bestford' barley and 'MT981384' barley, 'MT981427' and 'Horsford' barley.
'Mondak' triticale yielded the least. Although quality data is not yet available, past studies have shown barley to have the most stable nitrate concentrations, an important safety factor for livestock forage.

Please refer to the table on the next page.

2005 SPRING CEREAL FORAGE TRIAL

Kalispell Montana

Cultivar	Species	Stand *%plot*	Heading *day*	Anthesis *day*	Harvest *date*	Yield *t/a*
Hays	barley	**88**	**74**	82	7/13	3.01
Haybet	barley	**88**	69	80	7/14	2.93
MT981397	barley	**92**	**74**	**87**	7/18	3.04
Stockford (277)	barley	**90**	**74**	81	7/11	2.83
Westford	barley	87	**71**	78	7/11	2.79
Horsford	barley	**90**	63	74	7/14	3.23
Lucile	emmer	85	**74**	80	7/11	2.55
Mondak	triticale	78	**74**	80	7/11	1.85
SK3P	triticale	85	**74**	76	7/7	2.35
Kntz1094	spelt	**95**	63	81	7/15	2.92
Red 1	triticale	85	65	74	7/7	3.51
MTCF 304	triticale	85	69	75	7/7	2.67
92L012020	triticale	85	**71**	75	7/7	2.36
Awnless Trit	triticale	**88**	**71**	75	7/7	2.77
Bestford	barley	87	**74**	**84**	7/15	3.48
MT981427	barley	**92**	**74**	**85**	7/18	3.25
MT981384	barley	**93**	**74**	**87**	7/18	3.27
MT981377	triticale	83	**71**	75	7/7	2.87
mean		88	71	79		2.87
LSD(0.05)		8	4	4		NS
Pr>F		0.028	< 0.0001	< 0.0001		0.2286
CV(%mean)		5.4	3.8	2.9		22.0

Seeded 4/18/05 in R8.

Pesticides: 2,4-D + Banvel - 5/10/05

Fertilizer: 22 lbs/a N + 104 lbs/a P_2O_5 - 4/15/15

SPECIALTY CROP EVALUATION

759

Specialty crop evaluation is part of Project 759 and includes research related to a wide variety of unique crops from seeding to data collection to publications.

PROJECT TITLE National Winter Canola Variety Trial 2004-2005

PROJECT LEADER: Kansas State University
Cooperators: Duane Johnson, NWARC
Louise Strang, NWARC

OBJECTIVE: To evaluate germplasm over a wide range of environments and determine what canola varieties and experimental lines are adapted to a northwestern Montana environment.

METHODS: Twenty-nine cultivars/experimental lines of canola were seeded 9/10/04. Each plot consisted of 7-15' rows with 6" row spacing and 2' between plots. Seeding rate was 6 lbs/acre. The varieties were arranged in a split block configuration with 3 replicates. Stand establishment was evaluated by counting plants in square foot quadrats in each plot. The date on which 50% of the plants bloomed was recorded for each plot.

The plots were fertilized preplant on 9/8/04 with 50 lbs N, 60 lbs P_2O_5, 40 lbs K_2O, and 20 lbs S/a and topdressed 4/10/05 with 100 lbs/a N. No herbicides were used. The trial was swathed 7/21/05 and the seed thrashed 8/1/05. The seed was dried and weighed for yield determination, and 1-pint samples from each were weighed to determine test weight.

RESULTS: Stand establishment was good, with fall stands averaging 12.1 plants/ft^2 and spring stands averaging 10.2 plants/ft^2. Winter survival averaged 82.4%. The canola flowered between May 10 and May 16. Plant height varied from 48 to 69 inches. The plants matured between 7/26 and 8/1/05. Average lodging was 50% of the plot. Seed yield ranged from 1738 lbs/acre ('Rasmus') to 5023 lbs/acre ('Kronos'). Test weight ranged from 52.7 lbs/bu ('KS7436-055'') to 53.9 lbs/bu ('Casino').

A table summarizing this data is presented on the next page.

NATIONAL WINTER CANOLA VARIETY TRIALS

Kalispell, 2004-2005

Entry	Fall Std	Spr Std	Winter Survival	First Flower	Maturity	Height	Lodging	Yield	TWT
	pl/sqft	*pl/sqft*	%	*date*	*date*	*inches*	*% of plot*	*lbs/a*	*lbs/bu*
Abilene	8.1	8.1	**94.9**	5/15	7/28	55.6	**75**	3113.4	**53.8**
ARC2180-1	**16.9**	**14.8**	**87.8**	5/15	7/29	57.8	**83**	3363.0	**53.5**
ARC2189-1	13.7	**15.6**	**97.6**	5/14	7/30	58.7	**53**	3388.0	**53.5**
ARC92004-1	13.4	**12.6**	**86.9**	5/16	7/28	62.0	**83**	3261.6	**53.3**
ARC92007-2	**17.3**	**14.1**	**81.2**	5/15	7/26	60.7	**60**	3628.5	53.1
Baldur	8.7	7.6	**87.0**	5/13	7/28	54.0	23	3283.2	53.1
Baros	12.1	10.8	**90.3**	5/15	7/28	54.7	**58**	3146.6	52.9
Casino	9.6	5.3	56.7	5/14	8/1	57.9	**52**	2002.4	**53.9**
Ceres	4.8	3.7	**79.2**	5/14	7/31	58.7	20	2884.9	**53.7**
KS7436-055	5.9	4.9	**82.7**	5/13	7/31	50.4	20	2896.8	52.7
KS3018	12.0	11.0	**90.8**	5/12	7/31	60.7	38	3360.6	**53.6**
Jetton	12.2	**12.6**	**90.3**	5/13	7/29	48.4	20	3126.8	53.0
Kronos	12.7	11.1	**85.2**	5/13	7/30	58.9	**92**	**5022.7**	**53.9**
KS2064	11.7	**12.1**	**100.0**	5/14	7/29	57.1	**83**	2867.2	53.1
KS2098	**18.0**	**13.3**	**75.1**	5/16	7/31	61.4	**75**	3005.3	53.0
KS2169	**15.7**	9.8	64.0	5/13	7/29	58.9	30	3073.2	**53.4**
KS2004	**16.9**	10.6	62.3	5/15	7/29	62.0	**60**	2721.0	53.0
KS2185	**16.1**	11.4	71.4	5/10	7/28	49.4	**68**	2889.7	52.8
KS7436-055	10.8	7.1	66.4	5/15	7/31	53.6	**60**	2847.8	53.1
KS9124	**14.6**	**14.2**	**91.0**	5/15	8/1	58.4	**75**	3194.3	53.1
KS9135	**17.6**	**13.1**	**75.1**	5/15	7/29	**63.0**	**62**	3578.0	**53.7**
NPZ 0326	13.7	**11.9**	**82.3**	5/14	7/28	55.4	20	**4427.9**	53.0
Plainsman	9.9	6.3	64.2	5/16	7/31	**69.3**	17	2339.5	**53.4**
Rasmus	5.7	4.4	**75.8**	5/11	7/31	54.0	45	1737.5	53.0
Sumner	8.3	7.7	**88.8**	5/11	7/28	55.8	**53**	2898.7	**53.6**
Titan	8.6	9.6	**93.7**	5/14	7/29	59.0	20	3400.8	52.9
Virginia	8.3	8.7	**97.6**	5/13	8/1	57.0	17	2517.8	**53.5**
VSX-2	14.0	11.3	**81.8**	5/14	7/31	53.2	30	3105.5	**53.3**
Wichita	12.9	11.4	**89.0**	5/12	7/27	49.9	**67**	3129.5	**53.4**
mean	12.1	10.2	82.4			57.1	50	3110.8	53.3
LSD(0.05)	3.9	3.9	25.2			6.7	43	829.3	0.8
Pr>F	< 0.0001	< 0.0001	0.045			< 0.0001	0.001	< 0.0001	0.086

SUMMARY OF ORGANICALLY-GROWN CROPS

Kalispell 2005

TOMATILLAS

Total Yield - lbs/a (adjusted for planting rate)

	Fertilizer		
Color	manure	medic	mean
verdi	3207	3408	3308
purple	2987	3991	3489
mean	3097	3699	differences not significant

CORN

Total Yield - t/a (ears with husks)

	Variety	
Fertilizer	Bodacious	Honey Select
black medic	1.9	1.4
manure	1.9	1.5

differences not significant

Stolon Decay of Peppermint

I. Regional Project Title: Managing Plant-Microbe Interactions in Soil to Promote Sustainable Agriculture

II. Project Leader: Nancy W. Callan, Montana State University Western Agricultural Research Center, Corvallis MT

Collaborators: Duane Johnson and Louise Strang, MSU Northwestern Agricultural Research Center, Kalispell, MT

Fall planting of peppermint in the Flathead Valley of Montana typically results in poor emergence the following spring. The resulting loss of stand leads to lower oil production and a greater requirement for weed control measures. Rhizoctonia, Fusarium, Sclerotinia, and Pythium have been isolated from stolon decay lesions. Research at Montana State University's Northwestern Agricultural Research Center (NWARC) has demonstrated the effectiveness of fungicide application at fall planting of mint stolons.

Replicated plots were established at the NWARC on October 27, 2004, to evaluate fungicides and biocontrol agents for control of mint stolon decay. Plots consisted of four rows 15 ft long and 1 ft apart, with four replications. Stolon segments (3 lbs, 4-6 in. long) were coated with 300 ml of the designated treatment and laid in furrows 4-5 in. deep. The viability of biological inocula was confirmed by dilution plating.

Treatment	Active	Label or test rate product/acre	Stand plants/ft row	Dry Matter lbs/a	Oil Yield lbs/a
Gem	trifloxystrobin	8 oz	5.3	4849 *	79.4
Prevail	carboxin/ PCNB/ metalaxyl	1 lb/100 lb	6.1 *	4336	63.0
GB34	Bacillus pumilus	0.013 g/2 gal	3.7	3676	61.2
Tilt	propiconazole	10 oz/a	3.6	4902 *	73.4
Plant Helper	Trichoderma atroviride	2.3 g/2 gal	3.5	3215	55.8
Champ 2	CuOH	2 oz/cwt	3.3	3996	68.5
Control	water		3.3	2728	42.6
Tops MZ	thiophanate methyl /mancozeb	1 lb/100 lb	2.8	4781 *	66.4
Medallion	fludioxonil	0.5 oz/1000 sq ft	2.6	3729	54.2
Quadris	azoxystrobin	15.4 fl oz	2.6	3619	55.5
T-22	Trichoderma harzianum T-22	2 lb/a	1.7	3587	55.7
LSD (0.05)			2.3	1777	
P =			0.032	0.042	ns

* = significantly different from control by LSD ($P \leq 0.05$).

Only the fungicide Prevail increased emerged plant stand in the spring of 2005 over the water-only control, and Gem, Tilt and Tops MZ increased dry matter production over the control. Oil yield was not significantly influenced by treatment, but was highly correlated with dry matter (r^2 = 0.89, P = <0.0001). The relationships between stand and dry matter (r^2 = 0.25, P = 0.0807) and stand and oil yield (r^2 = 0.29, P = 0.0565) was weaker due to the ease of spread of the mint plant from stolons.

Gem and Prevail, fungicides that were most effective in improving plant stand, are primarily labeled for control of Rhizoctonia diseases. Tops MZ and Tilt are also labeled for this pathogen. Tops MZ and Prevail increased dry matter and/or oil yield in previous studies of stolon decay in Montana. We can speculate that Rhizoctonia had a greater impact in this planting than did Pythium, Fusarium, and Sclerotinia, other genera of pathogenic fungi that have been isolated from decayed mint stolons.

The biocontrol agents *Trichoderma atroviride, Trichoderma harzianum,* and *Bacillus pumilus*, did not increase stand and yield of peppermint under these conditions. *Trichodeerma harzianum* is labeled for *Rhizoctonia* diseases and *B. pumilus* has activity against *Rhizoctonia solani* (Kanjanamaneesathian, World J Microbiol Technol 16:523, 2000). *Trichoderma atroviride* is also effective against *Rhizoctonia* (McBeath, personal communication).

Conclusion
Stolon decay of peppermint reduces over winter survival of fall-planted peppermint stolons in northwestern Montana. *Rhizoctonia, Fusarium, Sclerotinia,* and *Pythium* have been isolated from stolon decay lesions. Replicated plots were established at the Northwestern Agricultural Research Center in Kalispell in October of 2004 to evaluate pre-plant stolon treatment with three biocontrol agents (*Trichoderma atroviride, Trichoderma harzianum,* and *Bacillus pumilus*) and six fungicides. The fungicides Gem (trifloxystrobin), Prevail (carboxin/ PCNB/ metalaxyl), Tilt (propiconazole), and Tops MZ (thiophanate methyl /mancozeb) increased peppermint stand and/or dry matter yield over the water-only control, but none of the biocontrol agents were effective.

PROJECT TITLE: **Western Regional Winter Lentil Yield Trial**

PROJECT LEADER: Fred Muehlbauer, WSU
Cooperator: Duane Johnson, NWARC
Louise Strang, NWARC

OBJECTIVE: Compare winter survival and yield potential of experimental lentil breeding lines in a northwest Montana environment.

METHODS: Eight lentil accessions from Washington State University were seeded into 60 ft^2 plots at 14 seeds/ft^2 on 10/5/04. Stand counts were taken 5/2/05. Weed control was done by hand. Dates were recorded when 50% of each plot had bloomed and when 50% had reached maturity (yellow leaves, hard seed). The plants were uprooted when they reached maturity, and the seeds thrashed out when the plants were dry. The lentils from each plot were weighed to determine yield and 100-seed samples weighed to determine seed weight (# seed/lb).

RESULTS: All the entries survived the winter very well. First blooms appeared between 5/28 and 6/2. The plants had matured by 8/3. Deer had moved into the plot area before harvest and damaged some of the plants. Lentil yields ranged from 214 lbs/acre ('LC9979062') to 502 lbs/acre ('LC9979120'), averaging only 38% of the 2003-04 yields. LC9979120 had the smallest seeds and 'LC9976079' had the largest.

WESTERN REGIONAL WINTER LENTIL YIELD TRIAL

Kalispell, 2004-2005

Cultivar	Spring Stand	Flower	Maturity	Height	Yield	Seed Size
	%	*date*	*date*	*inches*	*lbs/a*	*#/lb*
WA8649041	77	6/2	8/3	18.0	278	16089
LC9976079	**83**	5/30	8/1	16.0	300	14246
LC9978057	**83**	5/28	7/19	14.5	258	15306
LC9978094	**79**	5/31	7/27	18.5	**449**	14345
Morton	**83**	5/29	7/22	15.0	347	15404
LC9979062	**81**	5/30	8/3	15.0	214	15000
LC9979065	**80**	6/1	8/3	14.0	**435**	15282
LC9979120	75	5/31	7/27	16.0	**502**	**17940**
mean	80			15.9	347.7	15452
LSD(0.05)	5			3.6	149	839
Pr>F	0.039			0.099	0.006	< 0.0001

Seeded 10/5/04.
Stands: 5/2/05
Harvested: 8/17/05
Fertilizer: 13 lbs N + 62 lbs P_2O_5 /a - Fall, 2004
Herbicide: Assure II (6oz/a) - 5/17/05

PROJECT TITLE: **Western Regional Spring Lentil Yield Trial**

PROJECT LEADER: Fred Muehlbauer, WSU
Cooperator: Duane Johnson, NWARC
Louise Strang, NWARC

OBJECTIVE: Compare yield potential of experimental lentil breeding lines with released varieties in a northwest Montana environment.

METHODS:
Fourteen lentil accessions from Washington State University and 6 named cultivars were seeded into 100 ft^2 plots at 8.3 seeds/ft^2 on 4/18/05. The soil was fertilized with 22 lbs. N/a and 104 lbs. P_2O_5/a. Stand counts were taken 5/11/05. Dates were recorded when 50% of each plot had bloomed. When the plants reached maturity (yellow leaves, hard seed) they were uprooted and left to dry in the plots. The lentils were thrashed out with a plot combine when the plants were dry. The lentils from each plot were weighed to determine yield and 100-seed samples weighed to determine seed weight (no. seeds/lb).

RESULTS: All the entries developed excellent stands. First blooms appeared between 6/21 and 7/5. The plants were swathed on 8/12 and the seeds were thrashed out on 8/16. Lentil yields ranged from 341 lbs/acre ('LC01600698L') to 1122 lbs/acre ('Pardina'). 'Crimson' had the smallest seeds and 'LC99602075L' had the largest.

WESTERN REGIONAL SPRING LENTIL YIELD TRIAL
Kalispell 2005

Cultivar	Cotyledon Color	Type	Yield lbs/a	SeedWt #/lb
Pennell	Yellow	Laird Type	391	7187
LC860359L	Yellow	Laird Type	546	7235
LC860616L	Yellow	Laird Type	544	6604
LC99600747L	Yellow	Laird Type	450	7358
LC99602075L	Yellow	Laird Type	428	6592
LC01600698L	Yellow	Laird Type	341	8005
Merrit	Yellow	Brewer Type	355	7843
Richlea	Yellow	Richlea Type	458	9382
LC01600732R	Yellow	Richlea Type	639	9710
LC01600828R	Yellow	Richlea Type	756	9351
Eston	Yellow	Eston Type	638	**13163**
LC01600736E	Yellow	Eston Type	714	12032
LC01602307E	Yellow	Eston Type	834	10702
LC02600698E	Yellow	Eston Type	512	**13015**
Pardina	Yellow	Pardina Type	1122	12356
LC02600397P	Yellow	Pardina Type	450	**13061**
Crimson	Red	Crimson Type	755	**14077**
LC01601751T	Red	Turkish Red Type	443	**13639**
LC01602062T	Red	Turkish Red Type	558	9982
LC02600449T	Red	Turkish Red Type	422	11338
		mean	521.7	8705
		LSD(0.05)	NS	1101
		Pr>F	0.101	< 0.0001
		CV(%mean)	46.4	9.3

PROJECT TITLE: **Western Regional Dry Pea Yield Trial**

PROJECT LEADER: Fred Muehlbauer, WSU
Cooperator: Duane Johnson, NWARC
Louise Strang, NWARC

OBJECTIVE: Compare yield potential of experimental spring pea breeding lines in a northwest Montana environment.

METHODS: Ten dry pea accessions from Washington State University and 2 named varieties were seeded into 100 ft^2 plots at 8.3 seeds/ft^2 on 4/18/05. All entries were short vine, semi-leafless type. The soil was fertilized with 22 lbs. N/a and 104 lbs. P_2O_5/a. Entries were arranged in a randomized complete block design with 3 replicates. Stand counts were taken on 5/11. Dates were recorded when 50% of each plot had bloomed and when 50% had reached maturity (yellow leaves, hard seed). The plants were uprooted when they reached maturity, and the seeds thrashed out when the plants were dry. The peas from each plot were weighed to determine yield and 100-seed samples weighed to determine seed weight (no. of seed/lb).

RESULTS: First blooms appeared between 6/19 and 6/24. The plants had matured by 7/25. The plants were uprooted and left to dry in the plots. When dry the peas were fed into a plot combine to be thrashed. Peas from each plot were weighed to determine yield and 100-pea sub samples were weighed to determine seed size (number/pound). Pea yields ranged from 719 lbs/acre ('PS01102958') to 1318 lbs/acre ('Delta'). 'PS0110745' had the smallest seeds and 'PS0010836' had the largest.

Western Regional Dry Pea Yield Trial

Kalispell, 2005

Cultivar	Cotyledon	Stand *#/sqft*	Bloom *date*	Nodes *to 1st flw*	Maturity *date*	Height *in*	Yield *lbs/a*	Seeds *#/lb*
PS810162	Green	18.6	6/21	11	7/20	16.7	1091	2137
PS0010804	Green	**23.2**	6/21	**13**	7/24	18.9	1048	2084
PS0110460	Green	18.9	6/20	11	7/24	16.9	1250	1940
PS0110745	Green	**22.0**	6/22	11	7/23	20.0	1053	**2314**
PS0110767	Green	18.3	6/19	**13**	7/21	20.8	980	2198
PS0110805	Green	21.3	6/23	**14**	7/25	**28.8**	721	**2270**
PS0110827	Green	19.3	6/21	**14**	7/25	**24.7**	752	2147
Stirling	Green	21.8	6/20	10	7/22	20.1	1156	2234
PS0010806	Yellow	13.7	6/22	11	7/21	20.6	781	1979
PS0010836	Yellow	18.9	6/24	12	7/23	17.6	1222	1886
PS01102958	Yellow	**23.4**	6/21	12	7/23	21.7	719	2011
Delta	Yellow	**26.9**	6/22	**13**	7/22	22.7	1318	2014
mean		20.5		12		20.8	1008	2101
LSD(0.05)		5.1		2		4.7	435	70
Pr>F		0.004		0.000		0.001	NS	< 0.0001
CV(%mean)		14.9		9.6		13.6		2.0

Seeded 4/18/05 in R8.