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

ANNUAL REPORT
2008 CROP YEAR

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2008

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NORTHWESTERN AGRICULTURAL RESEARCH CENTER
STAFF 2008

Full Time Staff Members — **Years in Service**

Robert N. Stougaard, Interim Superintendent – Professor, Weed Science 17
Began November 1991

Qingwu Xue – Research Associate 8
Began February 2000

Louise M. Strang – Research Associate 25
Began May 1983

Gary R. Haaven – Ag Research Specialist 25
Began April 1982

Barbara F. Honeycutt – Administrative Support 8
Began December 1999

Sarah Gunderson – Research Assistant I 13
Began current position January 2007

Janice Haaven – Research Assistant I 6
Began March 2003

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

Part-Time Seasonal Employees

Amy Edsall
Andrew Edsall
John Josephsen
Jennifer Xue

MSU Student Seasonal Employees

Jane Johnson

CLIMATOLOGY

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

CLIMATOLOGICAL OVERVIEW 2008
NORTHWESTERN AGRICULTURAL RESEARCH CENTER
Kalispell, Montana

The precipitation amounts for the 2007-2008 crop year were on track with the long-term average of this area. Nevertheless, the month of July stood out, receiving 3.8 inches as compared to the average of 1.70 inches of rainfall. Temperatures were slightly lower than normal, averaging 42.1 °F for the year as compared to the long-term average of 44.1 °F.

Summary of Climatic Data by Months for the 2007-2008 Crop Year (Sept. - Aug.) and Averages for the Period 1980-2008 at the Northwestern Agricultural Research Center, Kalispell, Montana

	Sept. 2007	Oct. 2007	Nov. 2007	Dec. 2007	Jan. 2008	Feb. 2008	Mar. 2008	Apr. 2008	May 2008	June 2008	July 2008	Aug. 2008	Total or Average
Precipitation (in.)													
Current Year	1.28	1.11	1.02	1.13	1.31	0.76	0.61	0.90	2.33	3.65	3.80	1.15	19.05
1980-2008	1.67	1.30	1.60	1.46	1.35	1.17	1.32	1.80	2.45	3.20	1.69	1.18	20.19
Temperature (F°)													
Current Year	53.6	40.3	32.6	26.2	19.4	30.2	32.9	37.8	47.6	55.6	65.1	63.6	42.1
1980-2008	53.5	42.2	32.4	24.4	24.6	37.2	35.0	43.2	51.5	57.6	64.3	63.4	44.1

Last killing frost[1] in spring

Spring 2008	May 10	28°F
Mean for 1980-2008	May 20	31°F

First killing frost[1] in fall

Fall 2008	Sept. 14	32°F
Mean for 1980-2008	Sept. 17	30°F

Frost Free Period	126
Avg. 1980-2008	119

Growing Degree Days April - August 2008:

Base 50	1,422.50
Base 40	2,411.00
Base 32	3,445.00

Maximum summer temperature	96°F	August 19, 2008
Minimum winter temperature	-22°F	January 21, 2008

1. In this summary 32 degrees Fahrenheit is considered a killing frost.

MAXIMUM / MINIMUM TEMPERATURES BY MONTH & DAY
JANUARY - DECEMBER 2008

YR	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
2008	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	28	3	33	26	43	26	38	23	48	32	73	47	91	60	82	43	62	42	70	36	52	29	46	33
2	23	2	33	25	44	30	38	20	52	26	68	51	81	58	82	43	57	38	73	38	56	33	49	37
3	26	5	32	22	41	28	42	21	M	M	58	43	74	52	74	43	62	39	72	39	50	37	42	18
4	40	25	31	18	34	30	51	26	61	26	64	44	84	53	75	40	67	42	66	44	48	27	31	31
5	42	33	29	18	40	28	52	26	65	35	58	49	81	53	79	41	66	41	57	46	36	32	26	10
6	37	34	33	24	38	27	39	29	65	41	60	44	76	53	84	48	61	42	58	37	36	23	30	22
7	33	21	33	25	43	22	43	29	62	42	56	42	78	50	92	55	65	41	57	37	40	23	41	30
8	27	18	37	26	43	22	43	31	49	39	46	41	78	49	89	55	67	34	60	35	39	34	39	28
9	28	23	37	29	43	30	46	22	52	26	58	41	79	55	84	59	68	36	51	24	43	38	34	28
10	31	21	41	32	M	M	47	25	54	28	57	37	83	59	83	61	72	40	49	24	45	39	38	30
11	33	22	41	32	54	29	43	26	57	33	37	32	83	59	71	41	63	34	46	24	47	35	39	26
12	36	28	39	31	49	31	53	26	53	34	44	32	78	42	74	44	69	35	45	17	42	37	42	17
13	38	30	40	31	44	20	60	28	48	35	61	44	68	39	80	47	74	38	46	18	49	36	28	13
14	40	14	34	26	45	20	70	33	53	41	70	44	75	45	82	48	67	32	54	30	46	21	13	-12
15	40	14	34	27	42	29	60	36	54	39	M	M	82	52	86	50	71	35	55	24	M	M	0	-10
16	27	3	38	28	44	31	46	31	68	40	70	37	82	50	86	49	75	36	51	25	M	M	6	-14
17	27	0	41	21	42	33	44	33	75	41	74	40	82	51	88	54	79	37	47	32	53	21	4	-8
18	22	17	36	13	45	32	57	29	80	48	78	42	82	44	95	54	75	38	61	44	53	27	13	2
19	27	17	36	11	45	30	51	27	61	55	73	40	82	44	96	57	78	39	57	30	62	28	12	0
20	28	14	37	11	43	28	37	16	75	50	70	40	80	43	79	51	78	40	59	29	47	25	3	-15
21	15	-22	42	12	38	29	32	22	69	44	79	47	83	45	62	53	75	41	48	30	41	25	0	-21
22	6	-17	41	13	37	28	41	24	51	43	83	49	87	53	63	49	53	46	48	25	42	30	3	-9
23	14	-6	41	14	42	21	46	27	55	44	76	42	87	53	71	40	56	39	50	22	41	20	8	-2
24	13	-4	35	19	45	20	43	29	57	42	74	48	73	51	78	40	57	34	47	22	40	17	16	1
25	13	-4	39	22	42	18	49	33	53	44	73	42	76	45	87	44	60	34	54	22	38	16	25	9
26	18	6	39	28	42	21	44	25	52	41	75	45	85	50	81	48	38	67	56	19	37	17	26	11
27	38	14	40	31	42	23	55	24	61	46	75	56	85	54	81	44	64	35	51	19	43	16	23	14
28	38	5	44	31	35	23	62	32	62	34	78	45	82	52	61	42	68	35	51	20	36	18	36	21
29	9	-1	42	26	39	24	69	33	42	44	84	47	81	45	64	47	67	35	54	22	36	22	41	23
30	29	6			33	28	54	29	65	49	89	51	82	49	79	48	68	35	54	24	41	33	32	18
31	33	21			40	21			65	41			70	38	73	46			58	25			31	10
AVG	27.7	11.0	37.2	23.2	40.5	25.2	48.5	27.2	56.9	38.2	65.4	42.1	83.0	51.5	79.4	47.9	66.1	38.7	55.0	28.5	41.3	25.3	25.1	11.0

MAXIMUM TEMPERATURE 96°F

MINIMUM TEMPERATURE -22°F

"M": missing data

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	0.00	21.28
2005-06	2.28	2.20	1.45	1.42	3.04	1.14	0.55	2.12	2.89	5.50	0.51	0.24	23.34
2006-07	1.95	1.10	2.28	0.95	0.39	2.26	0.54	1.62	3.29	1.35	0.75	0.23	16.71
2007-08	1.28	1.11	1.02	1.13	1.31	0.76	0.61	0.90	2.33	3.65	3.80	1.15	19.05
MEAN	1.61	1.25	1.54	1.41	1.31	1.17	1.32	1.80	2.45	3.20	1.69	1.14	20.14
	SEPT	OCT	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	TOTAL

Precipitation by Day for Crop Year September 2007- August 2008
Northwest Agriculture Research Center, Kalispell Montana

DAY	SEPT 2007	OCT 2007	NOV 2007	DEC 2007	JAN 2008	FEB 2008	MAR 2008	APR 2008	MAY 2008	JUNE 2008	JULY 2008	AUG. 2008	Year Total
1	0.18	0.06				0.01		0.02	0.04	0.00			
2	0.03	0.04		0.03				T		0.12	2.85		
3		0.06		0.19	0.15	0.01			M	0.14	0.14		
4		0.06		0.08			0.22			T	0.31		
5		0.01		0.01	0.02		0.02	0.07		0.04			
6		0.01		T	0.01			0.05	0.07	0.05			
7			0.03		0.02	0.08		0.02	0.10	0.05			
8	0.03		0.10		0.03	0.00		0.03	0.05	1.13			
9		T	0.12		0.14			T	0.02	0.12			
10			T	0.19	T			0.06		0.27			
11		0.20	0.03		T	0.07		0.13	0.23	1.32			
12			T	T		0.02			0.29	0.12			
13			0.11	T		0.12			0.14	0.10			
14				T		0.15	0.03		0.19				
15				0.09	0.03				0.03				
16			0.25		0.09	0.22	T	0.01					
17	0.08	0.10	0.04	T			T						
18	0.01		0.22	0.01	0.05		0.10						
19	0.25	0.22	0.09	0.08	0.03		0.02	0.05					
20		0.12	T	0.01	0.26		0.11					0.26	
21	0.12	0.01		0.01					0.39			0.43	
22		0.08		0.01					0.03	0.16		0.04	
23	0.08	0.08		0.11				0.06	0.02		0.50		
24	0.06		T	T			0.03	0.07		0.03			
25	0.01		0.03	T		0.06		0.01	0.13				
26	T			T	0.01							0.31	
27				T	0.25		0.07					0.06	
28				0.09	0.13		0.01					0.02	
29	0.40		T	0.08	0.08	0.02			0.26				
30	0.03	0.06	0.00	0.14	0.01			0.32	0.31			0.03	
31				T					0.03				
TOTAL	1.28	1.11	1.02	1.13	1.31	0.76	0.61	0.90	2.33	3.65	3.80	1.15	19.05

YEAR 2008 - GROWING DEGREE DAYS JANUARY THROUGH OCTOBER 2008
CALCULATED AT BASE 50, BASE 40, AND BASE 32
Page 1: January - May

JANUARY

Day	Temperatures MAX	Temperatures MIN	Growing Degree Days Base 50	Growing Degree Days Base 40	Growing Degree Days Base 32
1	28	3	0.0	0.0	0.0
2	23	2	0.0	0.0	0.0
3	26	5	0.0	0.0	0.0
4	40	25	0.0	0.0	4.0
5	42	33	0.0	1.0	5.5
6	37	34	0.0	0.0	3.5
7	33	21	0.0	0.0	0.5
8	27	18	0.0	0.0	0.0
9	28	23	0.0	0.0	0.0
10	31	21	0.0	0.0	0.0
11	33	22	0.0	0.0	0.5
12	36	28	0.0	0.0	2.0
13	38	30	0.0	0.0	3.0
14	40	14	0.0	0.0	4.0
15	40	14	0.0	0.0	4.0
16	27	3	0.0	0.0	0.0
17	27	0	0.0	0.0	0.0
18	22	17	0.0	0.0	0.0
19	27	17	0.0	0.0	0.0
20	28	14	0.0	0.0	0.0
21	15	-22	0.0	0.0	0.0
22	6	-17	0.0	0.0	0.0
23	14	-6	0.0	0.0	0.0
24	13	-4	0.0	0.0	0.0
25	13	-4	0.0	0.0	0.0
26	18	6	0.0	0.0	0.0
27	38	14	0.0	0.0	3.0
28	38	5	0.0	0.0	3.0
29	9	-1	0.0	0.0	0.0
30	29	6	0.0	0.0	0.0
31	33	21	0.0	0.0	0.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
27.5	11.4	0.0	1.0	33.5

February

Day	Temperatures MAX	Temperatures MIN	Growing Degree Days Base 50	Growing Degree Days Base 40	Growing Degree Days Base 32
1	33	26	0.0	0.0	0.5
2	33	25	0.0	0.0	0.5
3	32	22	0.0	0.0	0.0
4	31	18	0.0	0.0	0.0
5	29	18	0.0	0.0	0.0
6	33	24	0.0	0.0	0.5
7	33	25	0.0	0.0	0.5
8	37	26	0.0	0.0	2.5
9	37	29	0.0	0.0	2.5
10	41	32	0.0	0.5	4.5
11	41	32	0.0	0.5	4.5
12	39	31	0.0	0.0	3.5
13	40	31	0.0	0.0	4.0
14	34	26	0.0	0.0	1.0
15	34	27	0.0	0.0	1.0
16	38	28	0.0	0.0	3.0
17	41	21	0.0	0.5	4.5
18	36	13	0.0	0.0	2.0
19	36	11	0.0	0.0	2.0
20	37	11	0.0	0.0	2.5
21	42	12	0.0	1.0	5.0
22	41	13	0.0	0.5	4.5
23	41	14	0.0	0.5	4.5
24	35	19	0.0	0.0	1.5
25	39	22	0.0	0.0	3.5
26	39	28	0.0	0.0	3.5
27	40	31	0.0	0.0	4.0
28	44	31	0.0	2.0	6.0
29	42	26	0.0	1.0	5.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
35.9	22.4	0.0	6.5	77.0

March

Day	Temperatures MAX	Temperatures MIN	Growing Degree Days Base 50	Growing Degree Days Base 40	Growing Degree Days Base 32
1	43	26	0.0	1.5	5.5
2	44	30	0.0	2.0	6.0
3	41	28	0.0	0.5	4.5
4	34	30	0.0	0.0	1.0
5	40	28	0.0	0.0	4.0
6	38	27	0.0	0.0	3.0
7	43	22	0.0	1.5	5.5
8	43	22	0.0	1.5	5.5
9	43	30	0.0	1.5	5.5
10	M	M	0.0	0.0	0.0
11	54	29	2.0	7.0	11.0
12	49	31	0.0	4.5	8.5
13	44	20	0.0	2.0	6.0
14	45	20	0.0	2.5	6.5
15	42	29	0.0	1.0	5.0
16	44	31	0.0	2.0	6.0
17	42	33	0.0	1.0	5.5
18	45	32	0.0	2.5	6.5
19	45	30	0.0	2.5	6.5
20	43	28	0.0	1.5	5.5
21	38	29	0.0	0.0	3.0
22	37	28	0.0	0.0	2.5
23	42	21	0.0	1.0	5.0
24	45	20	0.0	2.5	6.5
25	42	18	0.0	1.0	5.0
26	42	21	0.0	1.0	5.0
27	42	23	0.0	1.0	5.0
28	35	23	0.0	0.0	1.5
29	39	24	0.0	0.0	3.5
30	33	28	0.0	0.0	0.5
31	40	21	0.0	0.0	4.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
40.5	25.2	2.0	41.5	149.0

April

Day	Temperatures MAX	Temperatures MIN	Growing Degree Days Base 50	Growing Degree Days Base 40	Growing Degree Days Base 32
1	38	23	0.0	0.0	3.0
2	38	20	0.0	0.0	3.0
3	42	21	0.0	1.0	5.0
4	51	26	0.5	5.5	9.5
5	52	26	1.0	6.0	10.0
6	39	29	0.0	0.0	3.5
7	43	29	0.0	1.5	5.5
8	43	31	0.0	1.5	5.5
9	46	22	0.0	3.0	7.0
10	47	25	0.0	3.5	7.5
11	43	26	0.0	1.5	5.5
12	53	26	1.5	6.5	10.5
13	60	28	5.0	10.0	14.0
14	70	33	10.0	15.0	19.5
15	60	36	5.0	10.0	16.0
16	46	31	0.0	3.0	7.0
17	44	33	0.0	2.0	6.5
18	57	29	3.5	8.5	12.5
19	51	27	0.5	5.5	9.5
20	37	16	0.0	0.0	2.5
21	32	22	0.0	0.0	0.0
22	41	24	0.0	0.5	4.5
23	46	27	0.0	3.0	7.0
24	43	29	0.0	1.5	5.5
25	49	33	0.0	4.5	9.0
26	44	25	0.0	2.0	6.0
27	55	24	2.5	7.5	11.5
28	62	32	6.0	11.0	15.0
29	69	33	9.5	14.5	19.0
30	54	29	2.0	7.0	11.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
48.5	27.2	47.0	135.5	251.5

May

Day	Temperatures MAX	Temperatures MIN	Growing Degree Days Base 50	Growing Degree Days Base 40	Growing Degree Days Base 32
1	48	32	0.0	4.0	8.0
2	52	26	1.0	6.0	10.0
3	M	M	0.0	0.0	0.0
4	61	26	5.5	10.5	14.5
5	65	35	7.5	12.5	18.0
6	65	41	7.5	13.0	21.0
7	62	42	6.0	12.0	20.0
8	49	39	0.0	4.5	12.0
9	52	26	1.0	6.0	10.0
10	54	28	2.0	7.0	11.0
11	57	33	3.5	8.5	13.0
12	53	34	1.5	6.5	11.5
13	48	35	0.0	4.0	9.5
14	53	41	1.5	7.0	15.0
15	54	39	2.0	7.0	14.5
16	68	40	9.0	14.0	22.0
17	75	41	12.5	18.0	26.0
18	80	48	15.0	24.0	32.0
19	61	55	8.0	18.0	26.0
20	75	50	12.5	22.5	30.5
21	69	44	9.5	16.5	24.5
22	51	43	0.5	7.0	15.0
23	55	44	2.5	9.5	17.5
24	57	42	3.5	9.5	17.5
25	53	44	1.5	8.5	16.5
26	52	41	1.0	6.5	14.5
27	61	46	5.5	13.5	21.5
28	62	34	6.0	11.0	16.0
29	42	44	0.0	3.0	11.0
30	65	49	7.5	17.0	25.0
31	65	41	7.5	13.0	21.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
56.9	38.2	141.0	320.0	524.5

YEAR 2007 - GROWING DEGREE DAYS JANUARY THROUGH OCTOBER 2008
CALCULATED AT BASE 50, BASE 40, AND BASE 32

Page 2: June - October

JUNE

Day	Temperatures MAX	Temperatures MIN	Growing Degree Days Base 50	Base 40	Base 32
1	73	47	11.5	20.0	28.0
2	68	51	9.5	19.5	27.5
3	58	43	4.0	10.5	18.5
4	64	44	7.0	14.0	22.0
5	58	49	4.0	13.5	21.5
6	60	44	5.0	12.0	20.0
7	56	42	3.0	9.0	17.0
8	46	41	0.0	3.5	11.5
9	58	41	4.0	9.5	17.5
10	57	37	3.5	8.5	15.0
11	37	32	0.0	0.0	2.5
12	44	32	0.0	2.0	6.0
13	61	44	5.5	12.5	20.5
14	70	44	10.0	17.0	25.0
15	M	M	0.0	0.0	0.0
16	70	37	10.0	15.0	21.5
17	74	40	12.0	17.0	25.0
18	78	42	14.0	20.0	28.0
19	73	40	11.5	16.5	24.5
20	70	40	10.0	15.0	23.0
21	79	47	14.5	23.0	31.0
22	83	49	16.5	26.0	34.0
23	76	42	13.0	19.0	27.0
24	74	48	12.0	21.0	29.0
25	73	42	11.5	17.5	25.5
26	75	45	12.5	20.0	28.0
27	75	56	15.5	25.5	33.5
28	78	45	14.0	21.5	29.5
29	84	47	17.0	25.5	33.5
30	89	51	18.5	28.5	36.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
65.4	42.1	269.5	462.5	682.0

JULY

Day	Temperatures MAX	Temperatures MIN	Growing Degree Days Base 50	Base 40	Base 32
1	91	60	23.0	33.0	41.0
2	81	58	19.5	29.5	37.5
3	74	52	13.0	23.0	31.0
4	84	53	18.5	28.5	36.5
5	81	53	17.0	27.0	35.0
6	76	53	14.5	24.5	32.5
7	78	50	14.0	24.0	32.0
8	78	49	14.0	23.5	31.5
9	79	55	17.0	27.0	35.0
10	83	59	21.0	31.0	39.0
11	83	59	21.0	31.0	39.0
12	78	42	14.0	20.0	28.0
13	68	39	9.0	14.0	21.5
14	75	45	12.5	20.0	28.0
15	82	52	17.0	27.0	35.0
16	82	50	16.0	26.0	34.0
17	82	51	16.5	26.5	34.5
18	82	44	16.0	23.0	31.0
19	82	44	16.0	23.0	31.0
20	80	43	15.0	21.5	29.5
21	83	45	16.5	24.0	32.0
22	87	53	19.5	29.5	37.5
23	87	53	19.5	29.5	37.5
24	73	51	12.0	22.0	30.0
25	76	45	13.0	20.5	28.5
26	85	50	17.5	27.5	35.5
27	85	54	19.5	29.5	37.5
28	82	52	17.0	27.0	35.0
29	81	45	15.5	23.0	31.0
30	82	49	16.0	25.5	33.5
31	70	38	10.0	15.0	22.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
80.3	49.9	500.5	776.0	1022.5

AUGUST

Day	Temperatures MAX	Temperatures MIN	Growing Degree Days Base 50	Base 40	Base 32
1	82	43	16.0	22.5	30.5
2	82	43	16.0	22.5	30.5
3	74	43	12.0	18.5	26.5
4	75	40	12.5	17.5	25.5
5	79	41	14.5	20.0	28.0
6	84	48	17.0	26.0	34.0
7	92	55	20.5	30.5	38.5
8	89	55	20.5	30.5	38.5
9	84	59	21.5	31.5	39.5
10	83	61	22.0	32.0	40.0
11	71	41	10.5	16.0	24.0
12	74	44	12.0	19.0	27.0
13	80	47	15.0	23.5	31.5
14	82	48	16.0	25.0	33.0
15	86	50	18.0	28.0	36.0
16	86	49	18.0	27.5	35.5
17	88	54	20.0	30.0	38.0
18	95	54	20.0	30.0	38.0
19	96	57	21.5	31.5	39.5
20	79	51	15.0	25.0	33.0
21	62	53	7.5	17.5	25.5
22	63	49	6.5	16.0	24.0
23	71	40	10.5	15.5	23.5
24	78	40	14.0	19.0	27.0
25	87	44	18.0	25.0	33.0
26	81	48	15.5	24.5	32.5
27	81	44	15.5	22.5	30.5
28	61	42	5.5	11.5	19.5
29	64	47	7.0	15.5	23.5
30	79	48	14.5	23.5	31.5
31	73	46	11.5	19.5	27.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
79.4	47.9	464.5	717.0	965.0

SEPTEMBER

Day	Temperatures MAX	Temperatures MIN	Growing Degree Days Base 50	Base 40	Base 32
1	62	42	6.0	12.0	20.0
2	57	38	3.5	8.5	15.5
3	62	39	6.0	11.0	18.5
4	67	42	8.5	14.5	22.5
5	66	41	8.0	13.5	21.5
6	61	42	5.5	11.5	19.5
7	65	41	7.5	13.0	21.0
8	67	34	8.5	13.5	18.5
9	68	36	9.0	14.0	20.0
10	72	40	11.0	16.0	24.0
11	63	34	6.5	11.5	16.5
12	69	35	9.5	14.5	20.0
13	74	38	12.0	17.0	24.0
14	67	32	8.5	13.5	17.5
15	71	35	10.5	15.5	21.0
16	75	36	12.5	17.5	23.5
17	79	37	14.5	19.5	26.0
18	75	38	12.5	17.5	24.5
19	78	39	14.0	19.0	26.5
20	78	40	14.0	19.0	27.0
21	75	41	12.5	18.0	26.0
22	53	46	1.5	9.5	17.5
23	56	39	3.0	8.0	15.5
24	57	34	3.5	8.5	13.5
25	60	34	5.0	10.0	15.0
26	38	67	2.5	12.5	20.5
27	64	35	7.0	12.0	17.5
28	68	35	9.0	14.0	19.5
29	67	35	8.5	13.5	19.0
30	68	35	9.0	14.0	19.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
66.1	38.7	249.5	412.0	611.0

OCTOBER

Day	Temperatures MAX	Temperatures MIN	Growing Degree Days Base 50	Base 40	Base 32
1	70	36	10.0	15.0	21.0
2	73	38	11.5	16.5	23.5
3	72	39	11.0	16.0	23.5
4	66	44	8.0	15.0	23.0
5	57	46	3.5	11.5	19.5
6	58	37	4.0	9.0	15.5
7	57	37	3.5	8.5	15.0
8	60	35	5.0	10.0	15.5
9	51	24	0.5	5.5	9.5
10	49	24	0.0	4.5	8.5
11	46	24	0.0	3.0	7.0
12	45	17	0.0	2.5	6.5
13	46	18	0.0	3.0	7.0
14	54	30	2.0	7.0	11.0
15	55	24	2.5	7.5	11.5
16	51	25	0.5	5.5	9.5
17	47	32	0.0	3.5	7.5
18	61	44	5.5	12.5	20.5
19	57	30	3.5	8.5	12.5
20	59	29	4.5	9.5	13.5
21	48	30	0.0	4.0	8.0
22	48	25	0.0	4.0	8.0
23	50	22	0.0	5.0	9.0
24	47	22	0.0	3.5	7.5
25	54	22	2.0	7.0	11.0
26	56	19	3.0	8.0	12.0
27	51	19	0.5	5.5	9.5
28	51	20	0.5	5.5	9.5
29	54	22	2.0	7.0	11.0
30	54	24	2.0	7.0	11.0
31	58	25	4.0	9.0	13.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
54.9	29.4	89.5	239.5	390.5

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: Intrastate Winter Wheat Evaluation

Project Leader: Bob Stougaard

Project personnel: Qingwu Xue, Phil Bruckner, and Jim Berg

Objectives: To evaluate winter wheat varieties and experimental lines for agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

The 2007-2008 growing season was wetter and cooler than normal. This delayed plant development such that the average Julian heading date for the nursery was 166 (June 15) as opposed to 155 (June 4) for the previous year. Hawken and Tiber had the earliest and latest heading dates, respectively. The cool conditions also appeared to have suppressed the development of foliar diseases and extended the grain filling period, benefiting yields in the process. Jagalene, Pryor, Ripper, Promontory, Yellowstone, and Bill Brown all produced yields greater than 140 bu/A. Yields averaged 127 bu/A, as compared to 91 bu/A during the previous year, and ranged from a high of 147 bu/A for MTS0713 to a low of 101 bu/A for Rampart. Test weights also were higher than normal, averaging 64.5 lb/bu as compared to 59.2 lb/bu during the previous year. Plant heights were normal, averaging 39 inches. However, lodging was more severe in 2008 compared to 2007, averaging 30 and 2 percent, respectively. Rocky and MTS0608 were most susceptible to lodging, having scores of 88 percent. Protein content was normal despite the higher grain yields, and averaged 12.2 percent for the nursery. Protein levels were highest for Vangard (14.8) and MTS0633 (14.4) while Pryor and NuSky had the lowest concentrations (10.6).

Summary:

Overall, the 2007-2008 growing season was favorable for winter wheat production, resulting in higher yields and test weights compared to the previous year. Lodging was more severe and protein levels were about average.

Future Plans:

Continue to evaluate winter wheat for the purpose of identifying varieties that are best suited for District 1.

Table 1. Agronomic data from the intrastate winter wheat nursery grown at Kalispell, MT.

Planted: September 13, 2007		Field D3					Harvested: August 12, 2008	
Entry	Cultivar	Yield	Test weight	Grain Moist.	Heading date	Plant height	Lodging	Protein
		bu/ac	lb/bu	%	Julian	in	%	%
49	MTS0713	147.0	65.2	11.0	167.7	37.1	10.0	11.1
47	MTW06118 (HWW)	146.9	66.1	11.2	167.7	40.9	0.0	10.9
6	Jagalene	145.3	65.5	10.6	166.3	37.0	1.7	12.6
37	DH00-18-196	142.5	65.2	10.6	169.3	39.2	25.0	11.0
8	Pryor	142.1	64.3	10.7	168.7	35.2	0.0	10.6
30	Ripper	141.8	63.9	10.2	158.3	34.4	3.3	12.7
28	MTS0532 (HWW)	141.7	64.6	11.5	166.7	37.3	11.7	12.0
11	Promontory	141.6	66.0	12.2	168.3	41.2	31.7	11.0
24	MT0495	141.4	65.3	11.4	167.0	38.1	5.7	11.2
25	MTS04114 (HWW)	141.3	64.7	11.5	167.3	39.1	15.0	11.9
46	MT06103	141.2	64.7	10.9	164.3	40.9	0.0	13.4
10	Yellowstone	140.9	63.5	12.0	169.0	40.6	6.7	11.9
35	Bill Brown	140.8	64.9	10.5	161.7	36.2	15.0	10.8
26	MTS04120	140.2	65.6	10.9	167.7	41.7	5.0	11.4
5	Ledger	138.9	64.9	10.6	164.7	37.4	5.0	11.9
29	MT0552	138.8	65.6	10.7	164.7	38.2	0.0	11.7
2	CDC Falcon	138.5	64.2	10.3	167.7	35.3	1.7	11.4
45	MT06102	136.9	64.3	10.5	164.3	41.6	1.7	12.9
27	MTS0531 (HWW)	135.4	63.6	11.1	167.0	37.7	18.3	12.3
19	Hyalite (CL, HWW)	134.6	63.9	11.0	164.3	39.9	11.7	13.0
34	BZ9W02-2051	133.0	65.8	11.4	168.7	37.4	28.3	11.0
16	Wahoo	132.9	63.9	10.5	162.7	37.8	23.3	11.7
33	Hawken	129.8	64.6	10.4	157.0	33.3	1.7	12.3
1	Genou	127.6	65.0	10.5	167.7	40.9	70.0	12.8
21	Bond CL	127.4	63.4	10.2	158.0	39.1	48.3	12.0
18	Carter	127.0	65.0	10.4	166.0	34.9	3.3	12.2
36	DH99-37-100	126.4	65.1	10.8	169.0	46.1	21.7	11.3
31	Alice (HWW)	124.4	63.8	10.0	160.3	35.2	0.0	13.1
39	WA8023	123.9	63.8	10.2	170.0	42.1	0.0	11.2
20	Norris (CL)	123.0	65.4	10.5	167.0	42.0	41.7	12.6
7	Tiber	122.9	64.6	11.2	170.7	45.9	61.7	12.1
14	NuSky (HWW)	120.3	63.8	12.5	169.3	41.3	45.0	10.6
4	Neeley	119.4	64.1	11.3	170.0	40.7	61.7	11.3
41	MTS0633	118.2	63.9	10.0	168.0	41.6	63.3	14.4
23	Wendy (HWW)	117.8	64.7	10.4	159.0	34.4	5.0	12.7
38	AP 503 CL2	116.5	64.6	10.2	166.7	35.7	1.7	12.4

Table 1. Continued

Planted: September 13, 2007		Field D3					Harvested: August 12, 2008	
Entry	Cultivar	Yield	Test weight	Grain Moist.	Heading date	Plant height	Lodging	Protein
		bu/ac	lb/bu	%	Julian	in	%	%
17	Bynum (CL)	115.5	65.2	10.5	163.3	41.5	36.7	13.7
12	Vanguard	112.3	64.2	9.8	167.7	42.9	70.0	14.8
42	MT0641	111.3	65.0	10.6	164.0	38.5	28.3	11.3
44	MT0688	110.5	63.7	10.3	167.7	39.6	63.3	11.6
13	NuWest (HWW)	109.7	64.3	11.5	169.7	42.9	78.3	11.8
48	MTS0705	109.1	64.7	10.7	170.0	42.5	86.7	13.4
43	MT0686	108.2	64.0	11.0	168.0	44.5	65.0	12.1
32	Darrell	107.0	64.0	10.4	162.7	37.7	11.7	13.7
40	MTS0608	105.8	63.7	9.8	166.3	40.3	88.3	14.0
15	Jerry	105.7	63.1	10.2	168.0	42.0	78.3	13.8
9	Rocky	102.2	64.5	10.7	167.7	42.9	88.3	12.2
3	Rampart	101.5	63.9	10.0	168.0	41.6	76.7	14.1
Mean		**127.2**	**64.5**	**10.7**	**166.2**	**39.5**	**30.1**	**12.2**
C.V. (%)		**6.13**			**0.52**	**3.48**	**54.61**	
LSD (0.05)		**12.63**			**1.40**	**2.23**	**26.69**	

Project Title: Evaluation of Spring Wheat Varieties for Resistance to the Orange Wheat Blossom Midge (OWBM).

Project Leader: Bob Stougaard

Project personnel: Qingwu Xue, Luther Talbert, and Susan Lanning

Objectives: To evaluate spring wheat varieties for agronomic performance and resistance to damage from the OWBM.

Results:

Twenty commercially available spring wheat varieties were evaluated as a subset within the Advanced Yield Trial to assess resistance to the OWBM. The previous crop was alfalfa and the field was fertilized with21-30-60-24 lb/A of N-P-K-S, respectively. The soil type was a Creston silt loam (25-50-25) with an organic matter content of 4%, a pH of 7.5, and a CEC of 20 meq/100g. The experimental design was a randomized complete block with three replications. The spring wheat varieties were planted on May 8, 2008 at a rate of 78 lb/A to a depth of 1.5 inches. Each plot was 15 foot long and consisted of 7 rows, spaced 6 inches apart.

Heading and pollination (anthesis) were recorded when 50 percent of the plants in a plot had reached the corresponding growth stage. Exposure duration (ED) was calculated as the difference between the two dates and represents the susceptible period for midge damage to occur. Height measurements were recorded on July 24, 2008. Three randomly selected spikes were collected on August 19. Each spike was dissected and the number of larvae, damaged kernels and healthy kernels were determined. Plots were harvested on September 15, 2008. Grain yield, test weight, and moisture were determined in each plot, while protein and falling numbers were determined from a composite sample of all three replications.

Cool temperatures persisted throughout much of the growing season and delayed plant development. The average Julian heading date for the nursery was 188 (July 7) and varied by six days with Volt heading last on July 12 (Table 1). Anthesis (flowering) began about six days after heading and averaged 195 Julian days. The ED averaged about 6 days, and ranged from a high of 8 days for Choteau and Corbin, to a low of 4 days for Outlook and Volt. While plant developmental rates varied among the varieties, there did not appear to be any relationship between plant phenology and midge infestation.

Midge densities were very high and averaged 85 larvae per spike. Larvae numbers ranged from a low of 13.2 for MT 0415 to a high of 193.7 for MTHW0471, demonstrating that oviposition preference varies widely among spring wheat varieties. Not surprisingly, spring wheat yields were largely determined by damage from the midge (Figure 1). Yields averaged 38 bu/A, ranging from a low of 17 bu/A for MTHW0471 to a high of 73 bu/A for MT 0415. There was no relationship between larvae per spike and the number collected as dockage.

Test weights averaged 58 lb/bu, and generally declined as larvae numbers increased (r^2=0.36). Protein concentrations were very high and averaged 17 percent. Protein ranged from a low of

15.5% for PF906408 to a high of 18.8% for Lillian, but there did not appear to be any relationship with midge density or yield. Likewise, falling numbers varied widely, ranging from a low of 47 for Vida to a high of 260 for Lillian. However, there was no relationship between midge densities and falling number values. Moreover, all varieties had values well below the minimum standard of 330.

Summary:

Yields were strongly affected by midge damage and there appears to great deal of variability with respect to oviposition preference among commercially available spring wheat varieties. Trends are emerging with respect to those entries that are susceptible (MTHW0471) and those which show resistance (MT 0414, Reeder).

Future Plans:

Continue spring wheat evaluations for the purpose of identifying cultivars with resistance to the orange wheat blossom midge.

Figure 1. Impact of OWBM larvae on spring wheat yield during 2008 at Kalispell, MT.

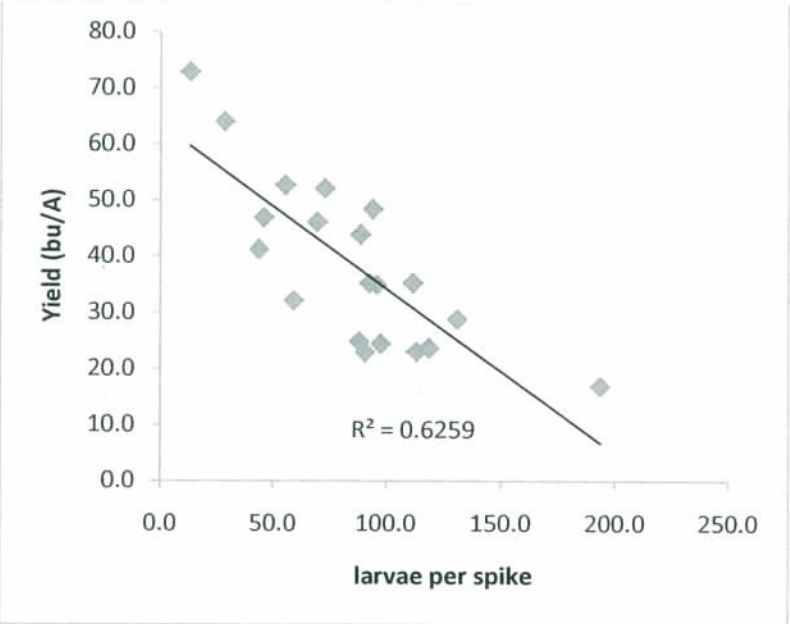

Table 1. Agronomic performance and attributes of OWBM midge resistance among spring wheat varieties grown at Kalispell, MT.

Planted: May 8, 2008 Harvested: September 15, 2008

Cultivar	Yield	Test weight	Falling No.	Protein	Heading	Anthesis	ED[a]	Plant height	Midge larvae		Total kernels	Damaged kernels	
	bu/ac	lb/bu	sec.	%	Julian		days	in	No./dock[b]	No./spike	No./spike	No./spike	%
MT 0415	72.8	60.7	206	17.0	188	193	5	37.1	1.7	13.2	33.2	7.6	21.9
REEDER	64.0	60.6	-----	16.3	188	193	5	36.4	6.0	28.6	35.0	11.6	32.7
JEDD	52.7	61.1	78	16.0	187	193	6	26.2	8.3	55.5	39.1	18.6	45.9
PF906408	52.1	58.3	143	15.5	188	195	7	28.6	3.3	72.9	41.1	22.1	54.4
VOLT	48.4	58.8	109	15.6	193	197	4	32.3	2.7	94.0	45.2	30.2	66.2
KELBY	46.9	58.4	95	16.6	187	193	6	28.9	3.7	45.9	36.3	15.7	42.3
HANK	46.1	58.4	124	16.6	187	194	6	28.9	6.7	69.6	43.0	20.7	48.6
CORBIN	41.2	60.0	158	16.9	187	195	8	33.9	8.3	43.8	33.3	17.2	53.0
MCNEAL	35.2	54.4	-----	18.1	188	195	7	32.4	4.7	111.8	38.6	27.4	71.4
FREYR	35.2	57.8	91	16.7	188	195	7	34.1	5.0	92.6	40.7	26.7	66.0
NORPRO	34.9	57.3	50	17.6	188	194	6	31.6	15.0	95.9	36.0	26.5	74.0
KUNTZ	32.1	59.0	138	16.8	189	196	7	29.4	10.1	59.2	35.9	19.2	49.4
LILLIAN	28.8	55.8	260	18.8	191	196	5	37.7	2.7	131.1	36.7	29.8	81.2
VIDA	24.8	57.3	47	18.1	189	196	7	32.5	9.0	88.1	39.6	27.2	68.4
FORTUNA	24.4	56.7	256	17.8	187	194	7	42.0	7.7	97.6	29.7	23.2	78.7
CHOTEAU	23.7	55.9	172	17.9	187	195	8	32.3	38.3	118.8	37.5	28.1	74.4
CONAN	23.1	58.1	237	17.3	188	194	6	29.9	7.0	113.4	37.4	24.0	64.9
OUTLOOK	23.0	53.7	-----	18.2	190	195	4	33.7	3.3	90.8	31.1	20.5	66.5
MTHW0471	17.0	57.7	153	17.9	191	197	5	37.7	14.7	193.7	52.9	42.2	79.5
Mean	**38.5**	**58.0**	**144**	**17**	**188**	**195**	**6**	**32.9**	**8.2**	**85.2**	**38.4**	**23.4**	**60.1**
C.V. (%)	**15.5**	**0.9**			**0.4**	**0.5**	**14.4**	**5.1**	**49.7**	**32.3**	**11.7**	**25.2**	**17.3**
LSD (0.05)	**10.0**	**0.9**			**1.3**	**1.5**	**1.5**	**2.8**	**6.8**	**46.4**	**7.6**	**9.9**	**17.5**

[a] Exposure duration is the time difference between heading and anthesis. [b] The number of midge collected as dockage.

Project Title: Agronomic Evaluation of Advanced Spring Wheat Experimental Lines

Project Leader: Bob Stougaard

Project personnel: Qingwu Xue, Luther Talbert, and Susan Lanning

Objectives: To evaluate spring wheat varieties and experimental lines for agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

Cool temperatures persisted throughout much of the growing season. These conditions delayed plant development such that the average Julian heading date for the nursery was 188 (July 7) as compared to 171 (June 20) in 2007 (Table 1). Heading dates varied by seven days with Thatcher heading last. Anthesis (flowering) began about six days after heading and averaged 194 Julian days. The difference between heading and anthesis is the exposure duration (ED) and represents the susceptible period for midge damage to occur. The ED averaged about 6 days, and ranged from a high of 8 days for Choteau and MT 0674 to a low of 4.3 days for Outlook, Thatcher, and Volt. Leaf area duration (LAD_{50}) was recorded as the date when 50% of the leaf tissue had senesced. The average LAD_{50} for the nursery was 223 (August 11), with MT 0669 and Vida having the earliest (213) and latest (232) senescence dates, respectively.

As with the previous two years, yields this season were ultimately determined by damage from the orange wheat blossom midge (OWBM). The number of midge per spike ranged from a low of 8 for MT 0414 to a high of 190 for Thatcher (Table 2). Similar trends were observed during 2007. Yields averaged 41 bu/A, ranging from a low of 17 bu/A for MTHW0471 to a high of 73 bu/A for MT 0415. It's worth noting that MT 0415 ranked as the third highest yielding entry in the 2007 nursery. Test weights were similar to last year and averaged 58.3 lb/bu. Likewise, protein levels were as high as last years and averaged 17% for the nursery. Plant height averaged 33 inches, ranging from 26.2 inches for Jedd to 44 inches for Thatcher. Lodging was not observed.

Summary:

Yields were strongly affected by midge damage. Trends are emerging with respect to which entries are susceptible (Thatcher, MTHW0471) and which show resistance (MT 0414, Reeder).

Future Plans:

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

Table 1. Agronomic data from the spring wheat advanced yield nursery grown at Kalispell, MT.

Planted: May 8, 2008 Field Y7 Harvested: September 15, 2008

Entry	Cultivar	Yield	Test weight	Grain moist.	Heading	Anthesis	ED[a]	LAD_{50}[b]	Plant height	Protein
		bu/ac	lb/bu	%	---------- Julian day ----------				in	%
19	MT 0415	72.8	60.7	11.8	188.0	193.3	5.3	229.3	37.1	17.0
43	MT 0746	65.4	59.0	11.3	186.0	193.0	7.0	223.7	36.5	16.9
4	REEDER	64.0	60.6	12.1	187.7	193.0	5.3	229.7	36.4	16.3
18	MT 0414	61.6	61.1	11.7	188.3	193.0	4.7	221.7	34.0	16.6
49	MT 0755	61.1	60.6	11.3	186.0	193.3	7.3	224.0	32.0	17.1
58	AP604 CL	57.6	62.1	11.6	186.0	193.0	7.0	221.7	33.7	16.9
39	MT 0735	57.4	58.7	11.9	186.0	190.9	4.9	226.9	36.7	15.8
26	MT 0657	57.0	58.6	11.1	187.7	194.0	6.3	226.7	31.8	16.3
41	MT 0744	56.2	59.5	11.6	187.3	194.0	6.7	225.0	36.2	16.6
47	MT 0750	54.5	58.7	11.5	188.7	196.0	7.3	225.0	36.5	17.2
44	MT 0747	53.1	59.9	11.3	186.7	192.7	6.0	221.0	30.7	16.9
28	MT 0664	52.9	58.8	11.3	187.7	195.3	7.7	219.3	33.2	17.1
13	JEDD	52.7	61.1	11.6	187.0	193.3	6.3	230.0	26.2	16.0
56	PF906408	52.1	58.3	11.0	188.0	195.3	7.3	223.0	28.6	15.5
54	MT 0770	52.0	60.7	11.5	186.0	190.9	4.9	219.9	34.1	16.7
35	MT 0716	51.9	59.2	11.9	188.7	194.3	5.7	224.0	31.6	16.4
21	MT 0605	50.9	56.8	10.6	189.0	193.7	4.7	217.7	31.0	16.6
55	PF906407	50.9	58.4	11.1	187.0	193.3	6.3	223.7	29.1	16.4
42	MT 0745	50.5	58.4	11.0	186.7	191.7	5.0	229.0	33.3	17.1
45	MT 0748	49.3	59.1	11.4	186.0	191.0	5.0	219.0	32.0	17.4
11	VOLT	48.4	58.8	11.2	192.7	197.0	4.3	223.7	32.3	15.6
20	MT 0515	48.0	60.0	11.5	188.7	194.3	5.7	226.7	33.3	16.1
51	MT 0761	47.9	60.1	11.3	186.7	193.0	6.3	219.0	32.4	17.8
16	KELBY	46.9	58.4	11.2	186.7	192.7	6.0	219.3	28.9	16.6
8	HANK	46.1	58.4	10.9	187.3	193.7	6.3	224.3	28.9	16.6
57	PF906409	45.9	58.2	11.3	187.7	194.0	6.3	226.0	30.3	16.6
50	MT 0759	45.8	58.9	11.2	186.3	192.0	5.7	221.3	32.0	16.8
34	MT 0715	44.6	59.7	11.5	187.3	193.3	6.0	219.7	32.0	16.7
62	MTHW0771	44.0	60.8	11.7	186.0	191.3	5.3	220.3	29.3	16.5
12	ONEAL	43.9	59.4	12.1	187.7	194.3	6.7	226.0	32.8	17.3
27	MT 0658	42.6	59.0	11.4	187.0	192.0	5.0	218.7	30.6	16.8
10	CORBIN	41.2	60.0	12.0	187.0	194.7	7.7	229.0	33.9	16.9
53	MT 0766	39.3	57.6	10.9	187.7	193.3	5.7	223.7	34.6	17.3
38	MT 0724	38.6	58.3	10.8	186.3	192.3	6.0	222.7	31.5	17.3
40	MT 0737	38.5	57.3	10.9	186.7	192.7	6.0	220.0	35.6	17.9

Table 1. Continued

Planted: May 8, 2008 Field Y7 Harvested: September 19, 2008

Entry	Cultivar	Yield	Test weight	Grain moisture	Heading	Anthesis	ED[a]	LAD_{50}[b]	Plant height	Protein
		bu/ac	lb/bu	%	---------- Julian day ----------				in	%
37	MT 0722	37.7	58.0	11.7	189.3	195.7	6.3	224.7	39.1	18.1
59	BZ9M1024	37.5	59.5	11.4	188.3	195.3	7.0	225.0	30.7	16.5
29	MT 0669	37.2	58.4	11.3	189.3	195.3	6.0	212.7	32.3	17.3
24	MT 0631	36.8	55.2	11.2	188.0	194.3	6.3	225.7	35.2	16.4
3	MCNEAL	35.2	54.4	10.2	188.3	195.3	7.0	219.7	32.4	18.1
15	FREYR	35.2	57.8	11.4	188.0	194.7	6.7	228.3	34.1	16.7
23	MT 0614	35.2	57.5	10.9	188.0	195.4	7.4	224.9	34.1	17.9
14	NORPRO	34.9	57.3	11.1	188.3	194.0	5.7	228.7	31.6	17.6
22	MT 0613	34.5	58.7	11.9	188.7	195.0	6.3	227.0	34.4	17.3
36	MT 0718	34.4	58.4	11.4	188.0	193.0	5.0	223.0	29.7	16.9
52	MT 0765	34.2	55.9	10.8	187.3	193.0	5.7	228.3	36.6	17.9
48	MT 0751	33.6	56.3	10.4	187.3	193.3	6.0	222.7	31.9	18.1
17	KUNTZ	32.1	59.0	11.6	189.0	195.9	6.9	222.4	29.4	16.8
30	MT 0674	32.1	57.6	11.1	187.0	195.0	8.0	215.7	32.4	18.3
61	MTHW0767	32.0	58.0	11.0	186.7	193.3	6.7	221.0	33.5	17.2
46	MT 0749	29.1	57.5	11.0	187.3	192.7	5.3	220.7	33.2	17.8
64	LILLIAN	28.8	55.8	10.7	190.7	196.0	5.3	215.0	37.7	18.8
33	MT 0713	28.1	57.9	11.2	188.0	195.0	7.0	225.7	35.4	18.0
25	MT 0640	27.8	57.2	10.9	186.0	191.3	5.3	228.0	34.0	17.3
32	MT 0708	27.4	56.8	11.1	188.3	195.0	6.7	230.0	36.5	19.1
31	MT 0707	24.9	57.7	10.9	188.0	195.9	7.9	225.4	32.8	18.5
7	VIDA	24.8	57.3	11.3	189.3	196.0	6.7	231.7	32.5	18.1
2	FORTUNA	24.4	56.7	11.3	187.0	194.0	7.0	220.0	42.0	17.8
6	CHOTEAU	23.7	55.9	10.8	186.7	194.7	8.0	223.7	32.3	17.9
1	THATCHER	23.6	57.8	11.4	192.0	196.3	4.3	223.0	44.1	16.7
9	CONAN	23.1	58.1	11.3	188.3	194.3	6.0	220.3	29.9	17.3
5	OUTLOOK	23.0	53.7	10.1	190.3	194.7	4.3	223.3	33.7	18.2
63	BZ902413	22.3	56.3	11.5	187.3	194.7	7.3	225.3	32.4	17.0
60	MTHW0471	17.0	57.7	11.0	191.3	196.7	5.3	225.0	37.7	17.9
	Mean	**41.5**	**58.3**	**11.3**	**187.8**	**193.9**	**6.1**	**223.6**	**33.3**	**17.1**
	C.V. (%)	**16.1**	**1.1**	**2.3**	**0.4**	**0.6**	**17.0**	**1.8**	**5.7**	
	LSD (0.05)	**11.0**	**1.0**	**0.4**	**1.4**	**1.8**	**1.7**	**6.5**	**3.1**	

[a] Exposure duration: time difference between heading and anthesis. [b] When 50% of the leaf tissue has senesced.

Table 2. Assessment of spring wheat for resistance to the OWBM at Kalispell, MT.

Planted: May 8, 2008		Field Y7				Harvested: September 15, 2008	
ENTRY	Cultivar	Yield	Midge larvae		Total kernels	Damaged kernels	
		bu/ac	No./dock[a]	No./spike	No./spike	No./spike	%
19	MT 0415	72.8	1.7	14.0	30.3	7.0	22.5
43	MT 0746	65.4	1.3	23.7	36.7	11.0	29.7
4	REEDER	64.0	6.0	30.7	38.7	13.0	32.9
18	MT 0414	61.6	1.7	7.7	32.7	6.7	20.1
49	MT 0755	61.1	0.3	8.0	32.3	4.7	13.2
58	AP604 CL	57.6	3.0	37.0	32.3	13.3	39.0
39	MT 0735	57.4	10.4	25.7	37.0	11.7	31.2
26	MT 0657	57.0	2.3	67.0	40.3	23.7	59.5
41	MT 0744	56.2	5.0	18.0	29.0	8.0	27.8
47	MT 0750	54.5	6.0	36.7	23.7	9.7	41.6
44	MT 0747	53.1	3.7	36.0	36.3	15.7	42.3
28	MT 0664	52.9	2.7	84.7	31.7	21.7	69.4
13	JEDD	52.7	8.3	31.0	33.0	8.7	26.9
56	PF906408	52.1	3.3	46.0	45.0	18.3	40.8
54	MT 0770	52.0	3.9	52.7	31.3	21.0	67.1
35	MT 0716	51.9	8.0	31.3	34.7	11.7	34.5
21	MT 0605	50.9	1.7	41.0	32.3	13.0	42.5
55	PF906407	50.9	1.7	87.0	46.0	25.3	55.2
42	MT 0745	50.5	4.0	40.3	29.7	17.0	56.9
45	MT 0748	49.3	1.3	11.7	36.3	5.0	14.7
11	VOLT	48.4	2.7	95.3	46.7	29.3	61.3
20	MT 0515	48.0	16.3	80.3	46.3	27.0	59.2
51	MT 0761	47.9	3.0	41.0	33.0	16.0	48.5
16	KELBY	46.9	3.7	31.0	31.0	11.0	35.0
8	HANK	46.1	6.7	79.3	43.7	20.3	47.3
57	PF906409	45.9	3.0	77.7	44.3	25.7	57.9
50	MT 0759	45.8	2.0	23.0	28.7	8.0	28.0
34	MT 0715	44.6	8.0	19.0	31.3	8.0	27.0
62	MTHW0771	44.0	5.3	87.3	35.3	26.7	74.4
12	ONEAL	43.9	5.3	89.7	49.0	33.7	67.9
27	MT 0658	42.6	3.7	14.0	24.3	4.0	15.9
10	CORBIN	41.2	8.3	36.7	32.3	14.7	47.7
53	MT 0766	39.3	0.7	63.0	31.7	15.0	42.8
38	MT 0724	38.6	15.7	69.3	46.7	21.7	46.1
40	MT 0737	38.5	8.0	21.7	23.0	6.3	28.1

Table 2. Continued

Planted: May 8, 2008		Field Y7				Harvested: September 19, 2008	
ENTRY	Cultivar	Yield	Midge larvae		Total kernels	Damaged kernels	
		bu/ac	No./dock[a]	No./spike	No./spike	No./spike	%
37	MT 0722	37.7	11.0	109.0	49.3	31.7	63.9
59	BZ9M1024	37.5	5.3	116.7	39.0	31.3	80.3
29	MT 0669	37.2	4.0	31.3	25.0	12.0	48.6
24	MT 0631	36.8	7.0	74.3	36.3	21.3	59.3
3	MCNEAL	35.2	4.7	112.0	41.0	28.0	68.3
15	FREYR	35.2	5.0	101.7	46.3	30.3	64.9
23	MT 0614	35.2	2.9	86.3	36.7	23.3	64.3
14	NORPRO	34.9	15.0	95.3	39.7	27.0	68.3
22	MT 0613	34.5	4.3	60.7	36.3	22.0	60.8
36	MT 0718	34.4	13.7	32.3	31.3	13.3	45.3
52	MT 0765	34.2	2.3	49.0	30.7	15.3	47.7
48	MT 0751	33.6	4.0	29.0	25.7	13.0	50.6
17	KUNTZ	32.1	9.9	23.0	31.0	8.0	24.0
30	MT 0674	32.1	10.0	116.3	39.3	30.7	76.9
61	MTHW0767	32.0	10.0	115.0	38.0	26.7	69.6
46	MT 0749	29.1	1.7	61.3	27.7	18.7	71.5
64	LILLIAN	28.8	2.7	128.3	38.7	28.7	72.9
33	MT 0713	28.1	19.3	63.0	33.7	16.7	49.4
25	MT 0640	27.8	3.3	67.3	35.0	22.7	64.6
32	MT 0708	27.4	15.0	86.0	38.7	21.0	53.9
31	MT 0707	24.9	10.4	104.3	29.3	24.0	80.4
7	VIDA	24.8	9.0	107.0	47.7	34.3	72.4
2	FORTUNA	24.4	7.7	122.0	32.3	25.0	77.2
6	CHOTEAU	23.7	38.3	159.0	42.3	36.7	86.0
1	THATCHER	23.6	9.3	189.7	46.3	40.3	87.1
9	CONAN	23.1	7.0	93.7	39.3	22.7	59.2
5	OUTLOOK	23.0	3.3	52.0	29.0	12.0	46.1
63	BZ902413	22.3	13.7	123.3	28.3	20.3	71.2
60	MTHW0471	17.0	14.7	172.3	50.7	37.0	73.0
	Mean	**41.5**	**6.8**	**66.2**	**36.0**	**19.2**	**51.8**
	C.V. (%)	**16.1**					
	LSD (0.05)	**11.0**					

[a] The number of midge larvae collected as dockage.

Project Title: Evaluation of Soft White Spring Wheat Varieties

Project Leader: Bob Stougaard

Project personnel: Qingwu Xue, Luther Talbert, and Susan Lanning

Objectives: To evaluate soft white spring wheat varieties and experimental lines for agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

Cool temperatures persisted throughout much of the growing season. These conditions delayed planting as well as heading and anthesis (flowering). Heading dates varied by eight days. Pettit had the earliest heading date, while Wakanz was the latest. Although cool temperatures may have delayed heading, this same set of conditions appeared to have suppressed foliar diseases and extended the grain filling period, benefiting yields in the process. Yields averaged 106 bu/A, ranging from a high of 119 bu/A for WA008008 to a low of 83 bu/A for the hard red check variety Choteau.

The long grain filling period also helped test weights. Test weights averaged 62 lb/bu and ranged from a high of 64.3 for Jubilee to a low of 59.3 for Calorwa. The highest protein levels were observed for the two hard red check varieties Choteau (15.5%) and Vida (14.7%). Of the soft white varieties evaluated, the highest protein levels were observed for Treasure and Wakanz (12.1) while the lowest proteins were observed for Pettit and the experimental line BZ604-00 (11.4). Plant height averaged 29 inches, ranging from 24.7 inches for Pettit to 32.2 inches for Zak. Lodging was not observed.

Summary:

While cool weather delayed planting and crop development, it did extend the grain filling period, which ultimately benefited yields and test weights.

Future Plans:

Continue to evaluate soft white spring wheat varieties for agronomic performance and yield potential in district 1.

Table 1. Agronomic data from the soft white spring wheat nursery grown at Kalispell, MT.

Planted: April 28, 2008						Harvested: August 25, 2008		
Entry	Cultivar	Yield	Test weight	Grain moisture	Plant height	Heading	Anthesis	Protein
		bu/ac	lb/bu	%	in	Julian		%
5	WA008008	119.4	60.4	12.6	30.2	179.0	187.0	12.2
4	NICK	118.5	61.7	11.3	29.8	179.0	187.7	11.8
11	PETTIT	116.5	63.8	11.3	24.7	177.3	186.3	11.4
10	CATALDO	113.5	62.2	10.9	28.9	178.0	186.0	12.1
15	BZ604-00	113.4	62.3	12.7	29.3	179.7	187.7	11.4
2	ALTURAS	109.8	61.6	11.8	28.7	182.0	188.3	11.5
7	TREASURE	108.1	60.2	12.3	29.7	184.0	188.7	12.6
18	CALORWA	107.9	59.3	11.9	27.7	180.7	186.7	12.2
20	VIDA	106.6	61.2	11.9	29.7	181.7	188.3	14.7
13	ZAK	106.0	62.1	11.2	32.2	182.7	189.3	12.4
16	BZ604-02	104.5	62.4	12.6	26.5	181.0	188.3	12.4
1	ALPOWA	103.9	63.2	11.7	31.8	183.3	188.7	12.5
3	LOUISE	103.5	61.9	11.3	31.0	182.7	189.7	11.6
8	CENTENNI	103.2	62.7	11.0	28.3	180.0	188.0	11.6
12	JUBILEE	103.1	64.3	11.4	31.0	181.7	188.7	12.1
6	WA008039	103.1	62.2	12.2	29.5	181.7	187.7	12.1
17	EDEN	100.2	63.6	11.4	28.9	182.0	187.7	11.6
14	WAKANZ	100.1	60.7	10.6	30.1	185.0	190.3	12.6
9	WHITEBIR	96.3	63.5	12.5	29.7	182.7	190.0	12.1
19	CHOTEAU	83.1	60.5	12.5	27.8	180.7	188.7	15.5
	Mean	**106.0**	**62.0**	**11.7**	**29.3**	**181.2**	**188.2**	**12.3**
	C.V. (%)	**6.87**	**1.76**	**10.17**	**5.06**	**0.37**	**0.42**	
	LSD (0.05)	**12.04**	**1.81**	**NS**	**2.45**	**1.10**	**1.31**	

Project Title: Evaluation of Canadian Spring Wheat Lines for OWBM Resistance

Project Leader: Bob Stougaard

Project personnel: Qingwu Xue

Project Cooperator: Steven Fox

Objectives: To evaluate Canadian spring wheat experimental lines for agronomic performance and resistance to the Orange Wheat Blossom Midge.

Results:

The nursery was established at the Northwestern Agricultural Research Center located near Kalispell, MT in a field with a previous history of low to moderate midge densities. The soil type was a Creston silt loam (25-50-25) with an organic matter content of 4%, a pH of 7.5, and a CEC of 20. The field was fertilized with 100-30-60-24 lb/A of N, P, K and S, respectively.

Twelve spring wheat entries were evaluated for resistance to the orange wheat blossom midge (OWBM). The entries consisted of 11 experimental lines from Dr. Fox's spring wheat breeding program at Winnipeg, Manitoba, plus the check variety 'Faller'. The Canadian entries were 90:10 mixtures of resistant to susceptible isolines, where the resistant materials contained the *Sm1* gene.

The experimental design was a randomized complete block with three replications. The spring wheat entries were planted on May 16, 2008 at a rate of 78 lb/A to a depth of 1.5 inches. Each plot was 15 foot long and consisted of 7 rows, spaced 6 inches apart. Heading and pollination were recorded when 50 percent of the plants in a plot had reached the corresponding growth stage. Exposure duration (ED) was calculated as the time period between these two events. Height measurements were recorded on July 24, 2008. Three randomly selected heads were collected on August 19. Each head was dissected and the number of larvae, damaged kernels and healthy kernels were determined. Plots were harvested on September 9, 2008. Grain yield, test weight, moisture, and protein were determined.

The 2008 planting season was cooler than normal. By the May 16 planting date, only 180 GDD's (base 40^0 F) had accumulated as compared to 475 on the same date during 2007. Cool temperatures persisted throughout much of the growing season, which delayed heading and anthesis (flowering). Nevertheless, there was good synchronization between adult midge emergence and spring wheat heading. Midge adults were first observed on June 30 (Julian 181) and continued to be detected into the second week of August. Concurrently, heading was first observed on July 7 (Julian 188) and continued to July 13 (Julian 194) (Table 1).

Although cool temperatures may have delayed heading, this same set of conditions appeared to have suppressed foliar diseases and extended the grain filling period, benefiting yields in the process. Yields averaged 73 bu/A, ranging from a high of 83 bu/A for BW395 to a low of 59 bu/A for BW365. BW395 not only produced the most grain, but also was the shortest entry in the nursery. While most entries were of standard height (mean=100 cm), no lodging was

detected. Test weights were good and averaged about 62 lb/bu. Protein averaged 13% and ranged from 12% for BW431 to 14% for BW365.

It's doubtful that yield was affected by OWBM damage. The check variety 'Faller' and BC21B had the highest midge densities recorded, with 6.1 and 5.8 larvae per spike, respectively. All other entries essentially had no infestation, demonstrating excellent resistance to the OWBM. It's worth noting that adjacent nurseries planted on the same day had midge numbers as high 71 larvae per spike.

In summary, all Canadian entries demonstrated excellent resistance to the OWBM. Yields were good considering the late planting date. Likewise, test weight and protein levels were well within acceptable standards. Although lodging was not observed, plant height might impact the acceptance of these materials since most entries were standard height materials.

Table 1. Evaluation of Canadian spring wheat lines for agronomic performance and resistance to the OWBM grown at Kalispell, MT.

Planted: May 16, 2008 field P2 Harvested: September 9, 2008.

Cultivar	Yield	Test weight	Grain moist.	Heading	Anthesis	ED[a]	Plant height	Midge larvae	Total kernels	Damaged kernels		Protein
	bu/ac	lb/bu	%	Julian		days	cm	No./spike		No./spike	%	%
BW395	83.6	61.6	12.8	189.7	195.3	5.6	87.0	0.0	30.9	0.0	0.0	12.97
BW431	79.3	62.2	13.6	189.7	195.7	6.0	97.3	0.0	31.1	0.0	0.0	12.17
BW430	77.8	61.7	13.6	189.7	195.7	6.0	113.3	0.0	31.4	0.0	0.0	12.60
BD94B	77.8	62.2	13.5	189.0	194.3	5.3	106.7	0.0	35.7	0.0	0.0	13.03
BW396	77.4	62.5	13.0	189.3	194.0	4.7	94.0	0.0	32.1	0.0	0.0	13.00
Faller	74.8	60.8	13.1	193.7	196.3	2.6	89.7	6.1	32.3	4.1	12.5	13.17
BD99A	74.2	61.2	14.3	193.0	196.7	3.7	95.7	0.0	39.8	0.0	0.0	12.60
BW394	71.1	62.1	13.8	190.7	195.0	4.3	106.0	0.0	31.7	0.0	0.0	12.20
BW415	70.2	61.7	13.0	188.3	193.3	5.0	103.7	0.0	30.8	0.0	0.0	12.97
BW362	69.6	62.3	12.8	189.0	195.7	6.7	105.0	0.2	33.8	0.1	0.4	13.60
BC21B	61.7	61.5	13.3	189.3	194.0	4.7	101.3	5.8	30.1	2.9	10.6	13.73
BW365	59.0	61.4	13.0	188.3	195.0	6.7	106.3	0.0	35.1	0.0	0.0	14.17
Mean	**73.0**	**61.8**	**13.3**	**190.0**	**195.1**	**5.1**	**100.5**	**1.0**	**32.9**	**0.6**	**2.0**	**13.02**
CV	**4.67**	**0.61**	**1.99**	**0.37**	**0.35**	**15.2**	**4.01**	**219.54**	**6.71**	**226.3**	**220.82**	**5.77**
LSD (0.05)	**5.77**	**0.64**	**0.45**	**1.19**	**1.15**	**1.31**	**6.82**	**3.75**	**3.74**	**2.27**	**7.31**	**1.27 (0.09)**

[a] Exposure duration is the time difference between heading and anthesis.

Project Title: Effect of Spring Wheat Planting Date on Resistance to the Orange Wheat Blossom Midge (OWBM)

Project Leader: Bob Stougaard

Project personnel: Qingwu Xue

Project Cooperators: Luther Talbert and Bill Berzonsky

Objectives: To identify spring wheat genotypes that are resistant to the orange wheat blossom midge.

Results:

This study was conducted a field with a previous history of low to moderate midge densities. The soil type was a Creston silt loam (25-50-25) and the field was fertilized with 100-30-60-24 lb/A of N, P, K and S, respectively.

Twenty six spring wheat entries were evaluated for resistance to the orange wheat blossom midge (OWBM). The 26 genotypes consisted of 6 experimental lines from Dr. Berzonsky's spring wheat breeding program at NDSU, plus twenty commercially available varieties from Dr. Talbert's uniform off-station spring wheat nursery.

The spring wheat entries were planted as three non-replicated trials, with each trial consisting of a different planting date. Since wheat is most vulnerable to midge damage from heading through pollination, the three planting dates were use in order to assure that each entry would be exposed to adequate midge pressures, regardless of individual maturity differences.

The planting dates were May 16, May 20, and May 27, with corresponding growing degree day units (base 40° F) of 179, 273, and 353, respectively. Entries were seeded at a rate of 78 lb/A to a depth of 1.5 inches. Each plot was 15 foot long and consisted of 7 rows, spaced 6 inches apart.

Heading and pollination were recorded when 50 percent of the plants in a plot had reached the corresponding growth stage. Exposure duration (ED) was calculated as the time period between these two events. Three randomly selected heads were collected in late August. Each head was dissected and the number of larvae, exuviae (cast off skins), damaged kernels and healthy kernels were determined. Larvae and exuviae numbers were added to arrive at a total larvae infestation. Entries within each of the three planting dates were harvested on September 16, September 19, and September 29, respectively. Grain yield, test weight, and moisture were determined.

There was good synchronization between adult midge emergence and spring wheat heading. Midge adults were first observed in emergence traps on June 30 (Julian 181; 923 GDD_{40}), and continued to be detected in pheromone traps well into the second week of August. Concurrently, spring wheat heading occurred from July 8 through July 24 (Julian 189 through 205) depending on the genotype and planting date (Table 1). The susceptible exposure period for midge damage to occur (ED) ranged from 2 to 11 days depending on the cultivar/line and

planting date. However, there did not appear to be any association between plant developmental rates, midge damage, or yield.

Averaged over all other factors, the first, second, and third planting dates corresponded to midge densities of 29, 33, and 35 larvae per spike, respectively (Table 2). Midge densities varied from a low of 0 larvae/spike for CAP19 to a high of 67 larvae per spike for PF906408. In addition to CAP19, NDSW0501, MT 0415, and Reeder also had low larvae numbers. CAP 19 carries the SM1 gene for resistance, but the mechanism of resistance is unknown for NDSW0501, MT 0415, and Reeder. However, the results suggest that a wide range in oviposition preference exists among the materials grown in this nursery. The most susceptible entries included Choteau, Hank, and Jedd, with each averaging 50 or more larvae per spike.

There was good agreement between larvae numbers and yield. Averaged over planting dates, yields ranged from a high of 60 bu/A for CAP19 and NDSW0608 to a low of 22 bu/A for Jedd and Choteau. Likewise, there was a close association between larvae numbers and test weight, with test weights decreasing as larvae numbers increased (Table 3). Averaged over planting dates, test weights varied from a high of 61 lb/bu for Reeder and NDSW0608 to a low of 54 lb/bu for Outlook and Choteau.

Summary:

Midge numbers were less than the previous year's high of 213 larvae per spike, which was recorded for Hank. Nevertheless, yields were negatively affected during 2008. More importantly, this year's results have provided confirmation as to which materials demonstrate resistance towards this pest. In particular, CAP 19, NDSW0608, NDSW0501, MT 0415, and Reeder have demonstrated resistance during both growing seasons.

Future Plans:

Discontinue the planting date nursery.

Table 1. Wheat development as affected by planting date (PD) and cultivar at Kalispell, MT.

Cultivar	Heading date (Julian days)				Anthesis (Julian days)				Exposure duration (days)			
	1st PD	2nd PD	3rd PD	mean	1st PD	2nd PD	3rd PD	mean	1st PD	2nd PD	3rd PD	mean
CAP19	196	199	205	200	198	204	210	204	2	5	5	4
NDSW0501	189	194	199	194	196	199	204	200	7	5	5	6
MT 0415	192	196	200	196	196	200	205	200	4	4	5	4
REEDER	193	196	201	197	196	202	205	201	3	6	4	4
VOLT	198	202	205	202	203	205	211	206	5	3	6	5
NDSW0608	191	196	199	195	196	204	207	202	5	8	8	7
AC Lillian	193	198	202	198	199	202	211	204	6	4	9	6
CAP20	190	196	202	196	196	198	205	200	6	2	3	4
KELBY	189	196	198	194	196	203	204	201	7	7	6	7
FORTUNA	191	196	201	196	196	204	211	204	5	8	10	8
VIDA	193	198	204	198	196	202	211	203	3	4	7	5
CONAN	192	196	202	197	199	207	212	206	7	11	10	9
NDSW0449	193	198	203	198	198	203	207	203	5	5	4	5
NORPRO	193	198	203	198	197	204	207	203	4	6	4	5
ONEAL	192	196	202	197	198	205	211	205	6	9	9	8
FREYR	192	197	202	197	196	203	207	202	4	6	5	5
KUNTZ	194	198	201	198	198	204	207	203	4	6	6	5
CORBIN	191	196	201	196	196	202	211	203	5	6	10	7
MCNEAL	193	197	203	198	196	204	211	204	3	7	8	6
PF906408	190	195	200	195	197	205	211	204	7	10	11	9
NDSW0601	194	198	203	198	197	203	207	202	3	5	4	4
MTHW0471	195	198	204	199	202	204	211	206	7	6	7	7
OUTLOOK	195	199	203	199	198	202	211	204	3	3	8	5
JEDD	189	195	199	194	196	199	205	200	7	4	6	6
HANK	189	195	201	195	196	202	207	202	7	7	6	7
CHOTEAU	189	196	203	196	195	199	211	202	6	3	8	6

Data is sorted based on cultivar rankings for susceptibility to OWBM infestation.

Table 2 OWBM Infestation, kernel damage, and yield as affected by planting date (PD) and cultivar at Kalispell, MT.

	Total OWBM				Percent damaged seed				Yield (bu/A)			
Cultivar	1st PD	2nd PD	3rd PD	mean	1st PD	2nd PD	3rd PD	mean	1st PD	2nd PD	3rd PD	mean
CAP19	0	0	0	0	0	0	0	0	64.6	56.9	58.9	60.1
NDSW0501	16	9	1	8	27	19	2	16	64.5	51.8	50.2	55.5
MT 0415	7	9	11	9	18	23	19	20	60.1	49.4	51.9	53.8
REEDER	10	6	18	11	20	14	38	24	63.9	58.9	51.6	58.1
VOLT	9	19	14	14	17	38	18	24	59.5	53.0	64.0	58.9
NDSW0608	13	21	14	16	23	33	19	25	68.2	57.7	55.9	60.6
AC Lillian	32	12	22	22	60	29	41	43	31.8	35.9	36.4	34.7
CAP20	13	27	28	23	24	59	58	47	28.8	15.7	15.7	20.1
KELBY	20	34	23	26	51	62	34	49	35.9	26.2	23.3	28.4
FORTUNA	10	19	55	28	48	47	73	56	37.1	28.1	22.5	29.3
VIDA	23	27	48	33	40	53	60	51	34.7	26.2	29.0	30.0
CONAN	21	41	36	33	40	58	57	52	30.6	26.2	26.3	27.7
NDSW0449	30	37	32	33	52	54	47	51	37.9	26.2	30.2	31.4
NORPRO	27	28	54	36	52	33	67	50	38.8	30.4	36.0	35.1
ONEAL	43	42	30	38	57	65	39	54	35.5	27.8	34.8	32.7
FREYR	26	58	33	39	55	69	45	56	34.7	27.2	36.5	32.8
KUNTZ	24	46	51	41	42	56	58	52	30.2	31.0	36.8	32.7
CORBIN	31	51	44	42	55	63	59	59	28.0	19.2	22.2	23.1
MCNEAL	26	50	53	43	54	71	72	66	46.8	38.2	29.5	38.2
PF906408	67	36	32	45	67	64	52	61	33.4	24.5	30.3	29.4
NDSW0601	66	35	35	45	81	59	59	66	22.7	20.0	26.7	23.2
MTHW0471	66	34	40	47	76	48	47	57	22.0	22.8	27.7	24.2
OUTLOOK	42	34	65	47	63	62	84	69	26.3	27.9	26.6	27.0
JEDD	57	56	36	50	81	72	60	71	25.5	17.6	23.9	22.3
HANK	30	54	66	50	39	80	63	61	37.9	28.9	32.0	32.9
CHOTEAU	38	60	60	53	67	71	62	67	26.8	20.1	19.3	22.1

Data is sorted based on cultivar rankings for susceptibility to OWBM infestation.

Table 3. Wheat height and grain quality as affected by planting date (PD) and cultivar at Kalispell, MT.

Cultivar	Height (cm)				Test weight (lb/bu)				Moisture (%)			
	1st PD	2nd PD	3rd PD	mean	1st PD	2nd PD	3rd PD	mean	1st PD	2nd PD	3rd PD	mean
CAP19	90	88	66	81	60.6	60.7	58.3	59.9	12.0	11.5	15.3	12.9
NDSW0501	104	96	95	98	61.2	61.5	58.4	60.4	11.9	11.4	14.5	12.6
MT 0415	90	89	85	88	61.4	61.2	57.9	60.2	11.7	11.5	14.4	12.5
REEDER	80	83	70	78	62.2	61.3	59.2	60.9	12.3	11.9	15.5	13.2
VOLT	78	77	63	73	61.4	59.7	60.1	60.4	12.1	11.8	14.9	12.9
NDSW0608	93	93	87	91	61.7	61.5	59.5	60.9	12.4	11.7	15.1	13.1
AC Lillian	98	98	87	94	57.2	58.6	55.6	57.1	11.3	11.1	14.3	12.2
CAP20	100	94	91	95	56.6	56.8	52.2	55.2	11.2	10.9	13.9	12.0
KELBY	67	67	67	67	58.6	57.6	55.0	57.1	11.4	10.7	13.7	11.9
FORTUNA	105	91	89	95	57.5	57.3	54.6	56.5	11.9	11.3	14.4	12.5
VIDA	83	83	63	76	59.2	58.1	55.9	57.7	11.9	11.7	15.5	13.0
CONAN	76	72	61	70	59.6	57.9	54.9	57.5	12.9	15.1	18.1	15.4
NDSW0449	96	84	69	83	58.9	58.8	55.9	57.9	11.8	11.0	14.6	12.5
NORPRO	75	70	60	68	59.1	58.4	57.0	58.2	11.4	12.0	14.8	12.7
ONEAL	81	74	74	76	59.9	58.8	57.6	58.8	12.0	12.8	15.1	13.3
FREYR	82	79	65	75	58.6	57.9	56.4	57.6	12.5	14.5	15.8	14.3
KUNTZ	77	72	68	72	60.1	60.1	58.8	59.7	12.2	12.5	14.7	13.1
CORBIN	83	72	69	75	60.4	58.6	56.9	58.6	11.8	12.2	15.0	13.0
MCNEAL	79	82	65	75	57.3	55.4	54.3	55.7	10.9	10.3	14.0	11.7
PF906408	75	65	73	71	57.0	55.4	55.1	55.8	11.1	11.1	13.9	12.0
NDSW0601	80	77	62	73	55.8	55.7	53.4	55.0	10.8	9.9	13.4	11.4
MTHW0471	95	95	85	92	59.0	60.0	57.6	58.9	11.6	11.2	14.4	12.4
OUTLOOK	74	81	70	75	55.1	54.9	53.4	54.5	10.8	10.3	13.8	11.6
JEDD	61	55	58	58	58.9	57.1	55.5	57.2	11.5	11.9	14.2	12.5
HANK	72	70	69	70	57.3	54.5	53.7	55.2	11.5	11.6	15.7	12.9
CHOTEAU	81	76	61	73	57.0	55.2	53.9	55.4	11.1	10.9	14.5	12.2

Data is sorted based on cultivar rankings for susceptibility to OWBM infestation.

Project Title: Off Station Barley Evaluation

Project Leader: Bob Stougaard

Project personnel: Qingwu Xue, Tom Blake, Stan Bates

Objectives: To evaluate barley varieties for agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

The 2008 planting season was wetter and cooler than normal. This not only delayed seeding, but plant development as well. The average heading date for the nursery was 181 (June 30), with MT020155 having the earliest heading date (177) and Geraldine being the latest (186). The cool conditions also appeared to have extended the grain filling period, benefiting yields in the process. Haxby, Merit and Boulder each produced greater than 100 bu/A. Yields averaged 83 bu/A, ranging from a high of 104 bu/A for MT010158 to a low of 53 bu/A for Geraldine. Test weights were higher than normal. Test weights averaged 51 lb/bu, with Xena having the highest test weight of 53.3 lb/bu. Likewise, percent plumps also were high, averaging 95 percent. Plant height averaged 26 inches and no lodging was detected.

Summary:

Below normal temperatures delayed plant development and prolonged the grain filling period which enhanced yields and test weights.

Future Plans:

Continue off station barley evaluations for the purpose of identifying varieties that are best suited for District 1.

Table 1. Agronomic data from the off station barley nursery grown at Kalispell, MT.

Planted: April 28, 2008 Field R4 Harvested: August 25, 2008.

ENTRY	Cultivar	Yield	Test weight	Grain moist.	Heading	Plant height	Plump
		bu/ac	lb/bu	%	Julian	in	%
17	MT010158	104.4	51.4	11.6	180.7	26.1	95.5
1	Haxby	102.1	51.2	12.5	180.3	25.7	93.8
7	Merit	100.4	51.0	12.5	185.0	30.3	96.7
2	Boulder	100.1	53.1	11.8	182.0	24.8	94.8
4	WPB Xena	95.7	53.3	12.7	182.3	28.0	95.7
18	Challenger	93.4	52.9	12.5	180.0	27.2	97.3
19	MT020155	91.2	50.2	11.6	177.3	26.1	93.0
6	Conrad	90.8	51.2	12.1	182.0	24.9	97.0
16	Baronesse	90.0	51.8	11.6	182.7	25.9	95.8
9	Hockett	86.4	52.7	12.7	181.3	25.1	93.0
13	Legacy	85.6	48.6	11.2	182.7	26.9	94.0
15	Stellar-ND	80.2	48.8	10.8	181.7	26.0	93.7
12	Drummond	78.8	49.2	11.2	179.0	25.9	96.3
3	Eslick	76.2	53.2	12.0	184.7	22.8	93.7
14	Tradition	73.2	50.9	11.4	180.0	24.8	95.3
11	Craft	72.8	51.5	12.6	180.3	28.5	95.8
20	MT020204	67.3	52.8	12.1	180.3	23.0	97.2
5	Harrington	64.5	52.4	12.7	181.7	25.7	95.2
8	Metcalfe	64.3	51.5	14.1	182.7	26.2	94.5
10	Geraldine	53.1	52.6	11.7	186.0	21.8	95.3
	Mean	**83.5**	**51.5**	**12.1**	**181.6**	**25.8**	**95.2**
	C.V. (%)	**31.17**	**3.94**	**5.70**	**0.94**	**11.68**	**1.43**
	LSD (0.05)	**NS**	**NS**	**1.14**	**2.82**	**NS**	**2.25**

Project Title: Intrastate Barley Evaluation - 08

Project Leader: Bob Stougaard

Project personnel: Qingwu Xue, Tom Blake, and Stan Bates

Objectives: To evaluate barley varieties and experimental lines for agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

The 2008 planting season was delayed due to weather conditions that were wetter and cooler than normal. By the May 8 planting date, only 114 GDDs (base 40^0 F) had accumulated as compared to 317 GDDs on the same date in 2007. Cool temperatures persisted throughout much of the growing season, which delayed plant development. The average heading date (Julian days) for the nursery was 189 as compared to 176 during 2007. Although cool temperatures may have delayed heading, this same set of conditions appeared to have suppressed foliar diseases and extended the grain filling period, benefiting yields in the process. Yields averaged 134 bu/A compared to 78 bu/A during the previous year. Yields ranged from a high of 174 bu/A for Goldeneye to a low of 71 bu/A for MT061246. Although MT061246 produced the lowest yields, the protein levels were the highest in the nursery - 16.5%. In contrast, MT061011 and MT061025 had the lowest protein (11.4%). Overall protein concentrations were less in 2008 compared to 2007, with mean protein percentages of 13.7 and 15.6, respectively. Test weights were higher than normal and averaged 52 lb/bu as compared to 50 lb/bu in 2007. Plant height was normal and averaged 32 inches, with Craft being the tallest entry at 36 inches. No lodging was detected.

Summary:

Below normal temperatures delayed plant development and prolonged the grain filling period which enhanced yields and test weights. Goldeneye appears to have promise for this area of Montana.

Future Plans:

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

Table 1. Agronomic data from the intrastate barley nursery grown at Kalispell, MT

Planted: May 8, 2008 Field Y7 Harvested: August 29, 2008

Entry	Cultivar	Yield	Test weight	Grain Moist.	Heading	Plant height	Plump	Protein
		bu/ac	lb/bu	%	Julian	in	%	%
6	GOLDENEYE	173.9	48.7	14.4	187.0	32.5	92.4	14.4
59	MT061240	152.2	52.0	14.0	189.3	33.4	93.1	14.2
35	MT050062	152.1	53.0	14.7	189.3	35.3	97.1	12.7
33	MT050049	151.7	54.8	15.6	188.0	33.7	97.5	12.8
22	MT040024	151.0	52.6	14.2	188.3	28.9	95.5	13.0
30	MT050030	149.0	52.7	15.4	189.0	32.6	99.3	12.9
1	Aquila	148.5	50.0	14.1	187.7	33.6	95.6	13.7
29	MT040226	147.3	54.3	13.7	188.0	34.2	92.5	13.8
31	MT050035	147.0	53.0	14.5	190.7	33.9	99.3	13.4
27	MT040209	146.0	52.2	18.1	190.0	30.8	94.2	13.0
50	MT061058	145.7	53.4	16.2	189.0	35.0	97.9	13.7
47	MT061051	145.5	51.8	13.9	190.7	32.3	96.5	14.5
23	MT040073	144.9	53.9	14.5	189.3	32.4	95.6	14.1
4	Champion	144.8	52.4	14.5	188.7	35.0	96.5	14.5
34	MT050050	144.8	53.3	14.3	187.7	32.9	96.7	13.8
52	MT061104	144.4	52.0	14.5	189.7	33.4	97.7	14.3
18	MT030063	144.2	53.9	15.0	190.3	35.4	99.2	13.0
21	MT040013	143.6	53.4	15.2	189.7	33.1	97.9	12.8
26	MT040204	142.3	52.1	15.2	192.0	31.8	97.1	12.7
17	MT030042	141.4	53.8	15.4	189.7	29.9	96.4	12.2
19	MT030079	141.3	53.0	14.1	188.7	33.0	91.6	14.7
5	Conrad	141.3	52.8	14.7	190.3	31.0	92.0	13.3
32	MT050048	141.1	53.2	15.0	189.0	34.7	98.3	14.3
62	Tradition	141.1	51.5	14.1	187.7	34.7	98.7	13.5
9	Eslick	139.4	51.1	16.0	189.7	28.6	89.9	12.8
42	MT061035	139.0	51.7	14.2	190.7	30.2	96.1	14.8
8	Geraldine	138.3	51.9	15.3	191.3	30.8	93.6	13.7
20	MT030137	137.4	53.0	14.6	188.3	29.7	97.9	13.8
55	MT061169	136.2	52.8	14.7	190.0	31.7	96.2	15.1
15	MT020162	135.6	52.6	15.4	189.7	33.9	97.5	14.1
57	MT061207	134.9	53.1	14.2	187.3	33.1	97.7	13.7
40	MT061032	134.8	52.4	14.6	190.7	31.2	98.7	13.3
64	2B992657	133.8	47.1	14.7	191.0	33.2	85.7	14.6
7	Haxby	133.1	53.7	14.4	187.7	32.1	91.7	14.0
63	2B992316	132.9	52.8	14.5	189.0	32.4	93.8	12.0

Table 1. Continued

Planted: May 8, 2008 Field Y7 Harvested: August 29, 2008

Entry	Cultivar	Yield	Test weight	Grain Moist.	Heading	Plant height	Plump	Protein
		bu/ac	lb/bu	%	Julian	in	%	%
43	MT061042	131.6	52.5	14.8	190.3	32.4	99.0	13.8
10	Craft	131.2	54.1	15.2	187.7	36.3	98.4	13.9
49	MT061054	131.0	52.8	15.3	190.3	30.9	98.9	13.5
46	MT061048	131.0	51.8	13.7	189.7	30.1	95.9	14.2
12	MT010158	130.9	52.3	13.6	188.3	32.1	95.3	15.0
3	Boulder	130.9	52.5	14.8	190.0	30.0	97.4	15.1
61	MT061248	130.3	53.3	14.5	189.3	30.5	98.8	14.7
36	MT050201	129.3	52.1	14.7	186.7	35.9	94.1	14.9
38	MT061025	128.8	48.0	15.0	187.3	29.2	97.9	11.4
41	MT061034	128.4	52.3	14.9	191.3	30.1	98.1	14.1
2	Baronesse	127.4	52.8	16.2	189.3	31.1	98.1	12.9
45	MT061047	127.3	53.0	14.9	190.0	32.7	99.2	13.7
44	MT061045	127.1	53.0	14.6	190.3	31.3	98.8	13.4
48	MT061052	126.8	52.4	14.2	190.3	29.9	97.9	13.8
13	MT010160	126.7	52.8	13.7	189.0	34.6	91.4	13.5
25	MT040181	125.6	52.9	14.6	190.0	30.9	94.2	13.6
53	MT061134	125.3	51.7	15.0	190.7	33.8	97.6	14.0
37	MT061011	124.5	48.6	13.7	187.0	27.3	97.0	11.4
24	MT040130	123.8	53.5	15.2	192.0	30.8	98.8	14.0
11	Hockett	123.0	54.1	15.3	188.3	31.0	93.7	13.6
28	MT040216	122.9	54.1	14.7	189.7	31.5	96.4	13.2
14	MT020155	121.2	52.0	14.5	187.0	32.1	97.8	14.1
54	MT061160	121.0	53.0	14.4	189.7	32.7	97.1	14.5
16	MT020204	120.9	52.8	14.4	189.0	31.5	97.1	15.1
39	MT061026	119.3	48.3	14.1	187.3	27.5	97.9	11.8
58	MT061225	119.3	53.8	15.1	187.7	31.6	98.8	13.1
51	MT061100	118.9	51.7	14.3	190.7	28.8	97.3	14.0
56	MT061201	112.7	53.0	14.5	188.0	33.4	98.1	14.2
60	MT061246	71.5	52.5	14.6	188.3	32.1	99.5	16.5
	Mean	**134.5**	**52.4**	**14.7**	**189.2**	**32.1**	**96.4**	**13.7**
	C.V. (%)	**9.36**			**0.52**	**5.36**		
	LSD (0.05)	**14.95**			**1.55**	**2.20**		

Project Title: Evaluation of Soil Insecticides for OWBM Control

Project Leader: Bob Stougaard

Project personnel: Qingwu Xue

Objectives: To evaluate the efficacy of soil applied insecticides for the control of the orange wheat blossom midge.

Results:

The experiment was established at the Northwestern Agricultural Research Center located near Kalispell, MT in a field with a previous history of low to moderate midge densities. The soil type was a Creston silt loam (25-50-25) with an organic matter content of 4%, a pH of 7.5, and a CEC of 20 meq/100g. The field was fertilized with 100-30-60-24 lb/A of N, P, K and S, respectively. Freyr spring wheat was planted on May 16 at a seeding rate of 64 lb/A to a depth of two inches.

The treatments consisted of Warrior at 0.03 lb ai/A, Lorsban at 0.5 lb ai/A , and a non-treated check arranged in a randomized complete block design with four replications. Each plot was 15 by 10 feet with rows spaced 7 inches apart. Treatments were applied on June 16, three days after larvae were observed on the soil surface, using a CO_2 backpack sprayer in 20 GPA of water using Tee Jet 11002 flat fan nozzles. The area was irrigated on June 17 with approximately 0.6 inches of water. Emergence traps were placed in each plot and were monitored on a weekly basis for the presence of adults commencing June 30 and continuing to July 31, 2008. The number of adults captured in each trap was added to arrive at a total emergence number for each plot. Five randomly selected heads were collected on August 11. Each head was dissected and the number of larvae, damaged kernels and healthy kernels were determined. Plots were harvested on September 9, 2008. Grain yield, test weight, moisture, and protein were determined and the number of midge collected as dockage was recorded.

The effect of insecticide applications on adult emergence was marginal (Table 1). Differences among the treatments were not significant at the 5% level of probability. However, Lorsban had lower total numbers relative to Warrior at the 7% level of probability. Any initial advantage afforded by the reduction in adult emergence was apparently offset by recruitment from outside the treated area since insecticide treatments had no effect on larvae per spike, larvae collected as dockage, yield or grain quality. Indeed, yields tended to be highest for Warrior ($P>0.08$), which had the greatest total adult emergence counts. Midge densities averaged about 30 larvae per spike and grain yields averaged 28 bu/A. It appears that when extreme insect pressures exist, soil applied insecticides fail to have any substantial effect in terms of reducing insect densities.

Table 1. Effect of soil insecticides on OWBM control and spring wheat yield and quality at Kalispell, MT.

Planted: May 16, 2008 Field P2 Harvested: September 9, 2008

	Total emergence	Midge larvae		Heading date	Yield	Test weight	Grain moist.	Protein
Insecticide	No./Trap	No./Spike	No./dock[a]	Julian	bu/A	lb/bu	%	%
Warrior	13.8	27.6	2.8	189	30.3	59.6	14.9	14.8
Lorsban	4.6	27.4	3.0	189	27.8	59.0	14.7	14.8
Check	11.3	34.2	3.8	189	25.9	58.7	15.1	15.3
Mean	**9.9**	**29.7**	**3.2**	**189**	**28**	**59.1**	**14.9**	**15.0**
C.V. (%)	**64**	**41**	**81**	**21**	**10**	**1.3**	**4**	
LSD (0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	
Model P>F	0.14	0.47	0.42	0.35	0.02	0.39	0.04	
TMT P>F	0.07	0.65	0.80	0.30	0.08	0.23	0.38	
LSD	8.9	16	3.5	0.55	3.9	1.1	0.82	

[a] Refers to the number of midge larvae collected as dockage.

Project Title: Evaluating Copper Fertilization for Orange Wheat Blossom Midge Management in Spring Wheat

Project Leader: Bob Stougaard

Project personnel: Qingwu Xue

Objectives: To evaluate spring wheat varieties for agronomic performance and midge resistance as influenced by foliar applications of copper.

Results:

This experiment was conducted to determine if foliar applications of copper would reduce the damage caused to wheat by the orange wheat blossom midge (OWBM). The study was established in a field with a previous history of moderate midge densities. The soil type was a Creston silt loam (25-50-25) with an organic matter content of 4%, a pH of 7.5, a CEC of 20 meq/100g, and a copper concentration of 1.1 ppm.

The experimental design was a split plot with three replications, where copper treatments represented the whole plot factor, and spring wheat varieties were the subplot effect. Eight spring wheat varieties were planted on May 16, 2008 at a rate of 78 lb/A to a depth of 1.5 inches. Each plot was 15 foot long and consisted of 7 rows, spaced 6 inches apart. Copper was applied using Cop Flo (4-0-0-33%) at a rate of 0.5 pt/A on June 30, when the flag leaf was fully extended in the majority of the plots. This rate equates to 4.2 oz Cu/A, and was applied with a tractor mounted sprayer in 20 GPA using 11002 Tee Jet nozzles.

Heading and pollination (anthesis) were recorded when 50 percent of the plants in a plot had reached the corresponding growth stage. Height measurements were recorded on July 24, 2008. Leaf area duration (LAD) measurements commenced on July 29, and continued through mid-August. Three randomly selected spikes were collected on August 19. Each spike was dissected and the number of larvae, damaged kernels and healthy kernels were determined. Plots were harvested on September 9, 2008. Grain yield, test weight, moisture, protein, falling numbers, and thousand kernel weights were determined.

Copper applications only had a minor effect on crop development, on average, delaying heading by one day (Table 1). The impact of copper on LAD appeared to be more substantial, with copper applications tending to delay senescence. However, the response was not statistically significant.

Midge densities were sizeable and the difference in larvae numbers among varieties was large (Table 2). Larvae numbers ranged from a low of 8/spike for MT 0414 to a high of 71.7/spike for Hank. Concurrently, yields also varied greatly among varieties, ranging from a high of 82 bu/A for Faller to a low of 44 bu/A for Hank. Not surprisingly, there was a strong relationship between the midge densities and yield (Figure 1). Of the materials evaluated, Faller, MT 0414 and MT 0415 had the lowest larvae numbers and the highest yields, producing 75 bu/A or greater (Table 3). Although there were large differences in larvae numbers and grain yield, copper had no effect on either variable.

Grain quality parameters differed greatly among the eight varieties evaluated (Table 3). There were strong relationships between OWBM densities and grain quality, the one exception being thousand kernel weights. As larvae numbers increased, test weight and falling number values decreased, with correlation values of 0.87 and 0.47, respectively. In contrast, percent protein increased as larvae numbers increased (r^2= 0.78) owing to the reduction in seed starch content. Copper had no effect on any of the grain quality parameters, with the exception of protein. Averaged over varieties, percent protein increased from 14.7% to 15.4% when copper was applied.

Summary:

Foliar applications of copper had no effect on OWBM densities or grain yield. However, there was a positive response with grain protein.

Future Plans:

Continue to evaluate foliar applications of copper for use in cereals.

Project Title: 2004 *Medicago falcata* Trial

Project Personnel: Louise Strang

Objectives: Test feasibility of combining selected forage grasses

This trial was initiated in 2004 to test the feasibility of combining *Medicago falcata* (Mf) with orchard grass (OG)(*Dactylis glomerata* L.) or meadow brome grass (MB)(*Bromus biebersteinii* Roem. and Schult) for a cool-season forage crop in comparison with the same grasses seeded with *Medicago sativa* (Ms). Monocrops of Mf, Ms, OG, and MB were seeded at 10 lb/acre in 5-ft. by 15-ft. plots. The mixtures were seeded at 20% or 40% legume seed by weight mixed with the grass seed at the same total rate. The 4 monocrops + 8 mixtures were planted in a randomized complete block design with 4 replicates. The trial was grown on Flathead fine sandy loam soil with no irrigation. Total crop year precipitation and Growing Degree Days (base 32°F) are in Table 1.

The forage was harvested 3 times in 2005-2007 and twice in 2008. Total forage production was highest in 2005 and 2006, when crop year precipitation was highest. The *M. sativa* alone and in mixtures produced the most total forage. The *M. falcata* alone and in combination with the grasses produced only 54% of the total forage yield of the *M. sativa* and its mixtures.

When grown as sole species (monocrops) *M. falcata* produced only 25-31% as much alfalfa as *M. sativa* (Table 3). *M. falcata* mixtures also resulted in much lower alfalfa yields than the *M. sativa* mixtures (Table 4).

The two *falcata* /brome grass mixtures resulted in the highest yield of grass in any mixture (Table 5). Meadow brome alone and mixed with *M. falcata* produced the highest grass yields of any system (Table 6). This suggests that, after the first production year, meadow brome grass is a more aggressive grass species in this environment. If a grassy pasture with a small legume component is desired (the legume presumably increasing the feed quality of the forage), then a *falcata* x brome mixture may be desirable.

Table 1. Crop year precipitation and growing degree days. 2005-2008.

Year	CYPrecip.	GDD_{32}
	inches	*Apr-Aug*
2005	21.28	3655
2006	23.34	3546
2007	16.71	3889
2008	19.05	3446

Table 2. Total dry matter yield, 2005-2008.

Species	2005 TotalYld *t/a*	2006 TotalYld *t/a*	2007 TotalYld *t/a*	2008 TotalYld *t/a*	means
OG	2.99	2.55	1.20	1.42	2.04
MB	4.94	3.79	1.72	1.24	2.92
Falcata	2.03	2.88	2.22	2.15	2.32
Sativa	**5.17**	**6.37**	**4.59**	**4.69**	5.21
O80F20	3.18	2.93	1.65	2.39	2.54
O60F40	3.28	3.11	1.93	2.34	2.66
B80F20	**5.32**	3.65	2.43	1.97	3.34
B60F40	4.98	4.40	2.80	2.52	3.67
O80S20	4.70	**6.53**	**4.89**	**4.20**	5.08
O60S40	**5.44**	**7.72**	**4.40**	**4.42**	**5.49**
B80S20	**6.17**	**6.93**	**4.50**	**4.44**	**5.51**
B60S40	**6.75**	**7.74**	**4.86**	**4.05**	**5.85**
mean	**4.58**	**4.88**	3.10	2.99	
Pr>F	< 0.0001	< 0.0001	< 0.0001	< 0.0001	
LSD(0.05)	1.64	1.49	1.08	0.79	
CV(%mean)	24.8	21.2	24.3	18.4	

Table 3. Total alfalfa yield in the *Medicago* sp. Monocrops.

Total Alfalfa Yield (t/a)

Year	*M.sativa*	*M.falcata*
2005	**3.82**	1.12
2006	**4.68**	1.43
2007	3.14	0.80
2008	**4.48**	1.26
mean	4.03	1.15
SE	0.2272	0.2272
Pr>t	<.0001	0.0041

Table 4. Total alfalfa yield in mixed forage.

Species	2005 TotalAlf *t/a*	2006 TotalAlf *t/a*	2007 TotalAlf *t/a*	2008 TotalAlf *t/a*	means
O80F20	1.03	0.62	0.55	0.89	0.77
O60F40	0.43	0.56	0.58	1.07	0.66
B80F20	0.14	0.21	0.35	0.98	0.42
B60F40	0.17	0.79	0.87	1.56	0.85
O80S20	3.16	2.92	3.10	3.58	**3.19**
O60S40	3.30	3.63	3.25	3.21	**3.35**
B80S20	2.76	2.87	2.56	3.93	**3.03**
B60S40	3.05	3.31	2.73	2.80	**2.97**
Year					
mean	1.75	1.86	1.75	**2.25**	
SE	0.11				
Pr>F	<.0001				

Table 5. Grass yields in the alfalfa/grass mixtures from 2005-2008.

Grass Yield (t/a)

	2005	2006	2007	2008	MixMeans
B60F40	**4.81**	3.40	1.70	0.96	**2.72**
B60S40	3.70	2.75	1.36	1.24	2.26
B80F20	**5.18**	3.31	1.86	1.00	**2.83**
B80S20	3.41	2.58	1.15	0.51	1.91
O60F40	2.85	2.41	1.24	1.28	1.94
O60S40	2.14	2.37	0.24	1.21	1.49
O80F20	2.15	2.11	0.91	1.51	1.67
O80S20	1.55	2.24	0.95	0.66	1.35
					SE: 0.2044
Year Means	**3.22**	2.65	1.17	1.04	Pr>t: <.0001
SE:.1360					
Pr>t: <.0001					

Table 6. Total grass production in all monocrops and mixtures.

Species	2005 TotalGr *t/a*	2006 TotalGr *t/a*	2007 TotalGr *t/a*	2008 TotalGr *t/a*	means
OG	2.53	2.18	1.04	1.14	1.72
MB	4.94	3.64	1.67	1.09	**2.83**
Falcata	0.91	1.07	1.28	0.90	1.04
Sativa	1.35	0.44	0.45	0.22	0.61
O80F20	2.15	2.11	0.91	1.51	1.67
O60F40	2.85	2.41	1.24	1.28	1.94
B80F20	5.18	3.31	1.86	1.00	**2.83**
B60F40	4.81	3.40	1.70	0.96	**2.72**
O80S20	1.55	2.24	0.95	0.66	1.35
O60S40	2.14	2.37	0.24	1.21	1.49
B80S20	3.41	2.58	1.15	0.51	1.91
B60S40	3.70	2.75	1.36	1.21	2.26
Year mean	**2.96**	2.37	1.15	0.97	
SE=.1208					
Pr>F: <.0001					

Project Title: 2006 Intrastate Alfalfa Yield Trial – Dryland

Project Leader: Dennis Cash

Project Personnel: Louise Strang

Objectives: To evaluate the yield performance of alfalfa cultivars in a northwestern Montana dryland environment.

Results:

Eighteen alfalfa cultivars were planted 5/3/06 in a randomized complete block design with 4 replicates. Spring stands were adequate following a cool and dry winter. Below average precipitation in April was followed by above average rainfall in June and July (7.45 inches) which resulted in good late season production. Post-season regrowth yielded 1.35 t/a for a total season yield average of 5.30 t/a.

Summary:

Third-year production ranged from 4.56 t/a ('WL 343HQ') to 5.91 t/a ('Cooper'). There were no significant differences among varieties in total 2008 production.

Future Plans:

This trial will remain in production through 2009.

2006 Montana Intrastate Alfalfa Variety Yield Trials

Kalispell - Dryland 2008

Cultivar	MTNO	Std %Occup	H-1 Yield t/a	H-2 Yield t/a	H-3 Yield t/a	2008 Total t/a	2007 Total t/a	Total 2007-08 t/a
Ladak 65	2	60	1.88	1.74	1.27	4.89	3.77	8.66
Shaw	328	83	2.47	2.01	1.39	5.86	5.45	11.31
Melton	333	73	2.31	2.01	1.46	5.78	5.00	10.79
Cooper	335	75	2.52	1.89	1.51	5.91	5.12	11.03
54Q25	393	63	2.33	1.84	1.37	5.54	4.75	10.29
4R200	401	73	2.02	1.91	1.53	5.45	5.38	10.84
Ameristand 407TQ	402	56	2.10	1.69	1.30	5.08	4.15	9.23
DKA34-17RR	403	73	1.89	1.82	1.27	4.97	4.09	9.06
DKA41-18RR	404	65	2.46	1.62	1.20	5.28	5.42	10.70
Genoa	405	73	1.78	1.67	1.41	4.86	4.12	8.98
GrandStand	406	72	1.81	1.72	1.30	4.84	4.42	9.26
HB8300	407	69	2.32	1.74	1.22	5.28	4.16	9.44
HB8400	408	70	2.07	1.85	1.35	5.27	4.15	9.42
Impressive	409	79	2.31	1.94	1.50	5.74	4.50	10.23
Lariat	410	79	2.38	1.92	1.38	5.68	4.36	10.04
WL 343HQ	411	58	1.82	1.62	1.13	4.56	4.26	8.82
WL 355RR	412	62	2.06	1.78	1.36	5.21	4.92	10.12
Whitney	413	73	1.91	1.91	1.33	5.16	4.87	10.03
mean		70	2.13	1.81	1.35	5.30	4.60	9.90
Pr>F		0.7591	0.9928	0.9539	0.8084	0.9919	0.8620	0.8890
LSD(0.05)		NS	NS	NS	NS	NS	NS	NS
CV(%mean)		23.7	34.6	15.3	18.9	21.7	24.3	34.7

Planting date: 5/3/06

Fertilizer: 13 lbs N 62 lbs P_2O_5 /a preplant

H-1 Harvest date: 6/24/08
Stage at harvest: ebl

H-2 Harvest date: 7/30/08
Stage at harvest: FBL

H-3 Harvest date: 9/29/08
Stage at harvest: FBL

Project Title: 2006 Intrastate Alfalfa Yield Trial – Irrigated

Project Leader: Dennis Cash

Project Personnel: Louise Strang

Objectives: To evaluate the yield performance of alfalfa cultivars in a northwestern Montana irrigated/high rainfall environment.

Results:

Eighteen alfalfa and three sainfoin cultivars were planted 4/28/06 in a randomized complete block design with 4 replicates. Spring stands showed good occupancy following a cool and dry winter. Below average precipitation in April was followed by above average rainfall in June and July (7.45 inches) which resulted in good late season production. Post-season regrowth yielded 1.29 t/a for a total season yield average of 4.91 t/a. Sainfoin cultivars 'Remont' and 'Eski' produced over 1.75 t/a forage. The exp. 'RMR' cultivar had very poor stand reestablishment.

Summary:

Third-year production ranged from 4.11 t/a ('Ladak 65') to 5.26 t/a ('HB8400'). There were no significant differences among alfalfa varieties in total 2008 production.

Future Plans:

This trial will remain in production through 2009.

2006 Montana Intrastate Alfalfa Variety Yield Trials
Kalispell - Irrigated 2008

Cultivar	MTNO	Std	H-1 Yield	H-2 Yield	H-3 Yield	2008 Total	2007 Total	Total 2007-08
		%occup	t/a	t/a	t/a	t/a	t/a	t/a
Ladak 65	2	61	1.86	1.18	1.07	4.11	4.58	8.69
Shaw	328	75	2.02	1.35	**1.50**	4.87	5.10	9.97
Melton	333	75	2.22	1.42	1.40	5.03	5.44	10.46
Cooper	335	**80**	1.80	1.38	1.29	4.46	4.54	8.99
54Q25	393	**83**	2.10	1.39	1.30	4.78	4.55	9.33
4R200	401	**81**	2.33	**1.57**	1.30	5.20	5.00	10.20
Ameristand 407TQ	402	**81**	2.11	1.43	1.30	4.83	4.51	9.35
DKA34-17RR	403	**85**	2.47	**1.49**	1.21	5.17	4.38	9.55
DKA41-18RR	404	**84**	2.08	**1.49**	1.17	4.74	4.50	9.24
Genoa	405	**81**	2.43	1.39	1.19	5.01	5.13	10.13
GrandStand	406	**86**	2.39	**1.49**	1.32	5.20	4.94	10.14
HB8300	407	**85**	2.03	1.41	1.19	4.63	5.04	9.67
HB8400	408	**84**	2.29	**1.60**	1.37	5.26	5.08	10.33
Impressive	409	**88**	2.32	**1.49**	1.37	5.17	5.28	10.45
Lariat	410	**85**	2.38	**1.54**	1.32	5.24	4.83	10.07
WL 343HQ	411	**88**	2.13	1.41	1.08	4.62	5.09	9.71
WL 355RR	412	**83**	2.21	1.45	1.37	5.03	4.24	9.27
Whitney	413	79	2.05	**1.47**	**1.47**	4.99	4.83	9.82
mean		81	2.18	1.44	1.29	4.91	4.84	9.74
Pr>F		<.0001	0.51	0.0002	0.0038	0.1302	0.3006	0.0963
LSD(0.05)		9	NS	0.14	0.10	NS	NS	NS
CV(%mean)		7.5	17.9	6.8	11.3	10.3	12.0	8.2

Sainfoin

Cultivar	ID	Std	Yield	Yield		2008 Total	2007 Total	Total 2007-08
		%occup	t/a	t/a		t/a	t/a	t/a
exp. "RMR"	S1	11	0.36	0.06		0.41	1.32	1.73
Remont	S2	**46**	**1.66**	**0.37**		**2.03**	2.35	**4.37**
Eski	S3	**54**	**1.47**	**0.29**		**1.76**	2.70	**4.46**
mean		37	1.16	0.24		1.40	2.12	3.52
Pr>F		0.0506	0.0251	0.0451		0.0273	0.2742	0.0283
LSD(0.05)		35	0.90	0.24		1.13	NS	2.05
CV(%mean)		55.5	44.9	58.9		46.8	53.1	33.7

Seeded 4/28/2006
Harvest 1: 6/27/08
Stage at harvest: early bloom
Harvest 2: 7/29/08
Stage at harvest: mid bloom
Harvest 3: 9/30/08
Stage at harvest: mid bloom

SPECIALTY CROP EVALUATION

Specialty crop evaluation includes research related to a wide variety of unique crops from seeding to data collection to publications.

Project Title: 2007-2008 National Winter Canola Variety Trial

Project Leader: Mike Stamm, Kansas State University

Cooperator: Louise Strang, Montana State University

Objective: Evaluate and compare experimental and commercial winter canola varieties for their production potential in a northwest Montana environment.

Results: Twenty-one varieties of canola were seeded at 5 lbs/acre and 0.5 inch depth on 19 Sept. 2007 in a randomized complete block design with 4 replicates. Plots were seeded in seven 15-ft long rows with 6 inch row spacing. Fertilizer (30 lbs/a N, P_2O_5, K_20, & S) was applied pre-plant. No irrigation was used. The previous crop was fallow.

Fall stands were rated on Oct.30, 2007 and again on Apr.28, 2008 to determine winter survival. Although differences were not significant, survival ranged from 21% to 80% ('Sitro'). Bloom date (when 50% of the plants had started to flower) and maturity date (when 90% of the plants had lost their green color) were recorded. Lodging was variable but not extreme. Significant differences in seed yield, moisture content, and test weight were determined. Yields ranged from 1389 lbs/a to 2611 lbs/acre (Table 1).

Summary: We were able to identify cultivars with good winter hardiness and yield potential for this location. There is germplasm available which may make winter canola a viable rotation crop for this area.

Future Plans: We hope to further investigate the effects of seeding date and fertilizer on Winter survival, seed and oil yield and oil quality of winter canola.

Table 1. Winter survival and yield comparisons of winter canola cultivars.

Entry	FALL STAND (0-10)	SPRING STAND pl/sqft	SURVIVAL %	BLOOM date	MATURITY date	HEIGHT in	LODGING %plot	YIELD lbs/a	MOISTURE %	TEST WEIGHT lbs/bu
Sitro	3.9	**5.6**	**80**	5/23	7/28	54	17	**2611**	8.8	**49.1**
Kadore	4.8	**3.0**	40	5/29	8/5	53	3	1902	**10.4**	**49.7**
Baldur	4.1	2.6	**55**	5/25	7/30	57	9	1796	9.0	43.5
Ceres	6.9	**3.1**	26	5/26	7/30	60	15	1573	**10.7**	**47.1**
Kronos	5.2	**4.5**	**52**	5/25	7/29	57	4	1747	9.0	42.7
Virginia	6.5	**4.9**	**43**	5/24	7/29	57	9	1735	**9.9**	42.8
CWH630	5.2	**5.0**	**58**	5/24	7/29	54	4	1600	6.2	**46.4**
CWH633	**7.0**	**3.2**	28	5/27	7/30	57	4	1636	8.2	44.6
CWH686	3.7	1.9	28	5/25	7/29	57	5	1435	7.8	**49.9**
CWH687	6.3	**3.2**	30	5/26	7/30	59	1	1808	7.4	**46.2**
CWH688	5.2	3.1	35	5/27	7/29	56	**43**	1406	7.5	**48.4**
DKW13-69	5.7	2.7	31	5/29	8/6	58	1	2081	9.4	**45.2**
KS3018	6.5	**5.8**	**54**	5/24	7/28	57	4	1788	7.5	**49.2**
KS3074	**7.4**	**5.0**	**41**	5/26	7/29	59	10	1769	6.9	**47.6**
KS3077	**7.9**	**5.7**	40	5/26	7/29	54	**22**	1914	7.4	44.0
KS3254	6.9	2.5	21	5/27	8/4	58	5	1941	**12.7**	43.6
KS3302	7.2	**5.7**	**47**	5/26	7/28	56	**30**	1759	8.7	44.0
KS4022	5.7	**3.2**	30	5/28	7/28	57	**22**	**2270**	8.1	**46.4**
KS4158	6.3	**6.0**	**53**	5/25	7/30	60	7	1481	7.1	**48.4**
KS9135	6.5	**5.3**	**50**	5/26	8/3	57	10	1931	9.1	44.0
Wichita	6.5	**4.0**	35	5/28	7/30	58	7	1389	7.4	**45.6**
mean	6.0	4.1	42			57	11	1789	8.5	46.1
F	1.4	1.7	1.0			0.5	1.4	2.9	1.9	2.6
Pr>F	0.1537	0.0710	0.5112			0.9688	0.1689	0.0017	0.0447	0.0043
LSD(0.05)	NS	NS	NS			NS	NS	472	3.2	5.3
CV(%)	27.7	44.5	58.0			8.2	137.1	16.0	22.6	7.0
MSE	2.7	3.6	585.0			21.6	229.6	81886.7	3.7	10.3
R^2	0.44	0.48	0.35			0.21	0.44	0.61	0.50	0.59

Project Title: Statewide Camelina Trial, 2008

Project Leader: Peggy Lamb, NARC

Cooperator: Louise Strang, NWARC

Objective: Compare the oilseed yield and quality of 16 camelina (*Camelina sativa*) cultivars in a northwest Montana environment.

Results:

The trial was seeded on April 9, 2008 under conventional tillage, dryland, conditions following spring barley. Prowl was pre-plant incorporated at 4 pints/acre on April 4 for weed control. The cultivars were seeded in replicated, 15-foot, 7-row plots with 6-inch row spacing utilizing a `Hege' plot drill equipped with disk openers and packer wheels. Each plot was seeded with 2.34 grams, equal to seeding 3 lbs per acre. Seeding depth was ¼". Plant stand was determined by counting emerged plants per 3' section of row in 3 randomly selected locations of each plot. No post-emergence herbicides were applied, and all plots were kept weed free utilizing hand labor. Flowering date was recorded as the date when 50 percent of the plants within a plot had at least one open floret. Plant heights were measured from the ground to the top of the canopy. Pod shatter was minimal. The 75 square-foot plots were direct harvested using a Hege plot combine. Seed samples were cleaned in the laboratory using a 'Carter-Day Dockage tester' and then weighed following cleaning to determine seed yield. Seed test weight (pounds per bushel) and percent grain moisture content were obtained for each plot using a 'Dickey-john GAC 2100b' grain analyzer. Recorded grain yields are reported in pounds per acre. Grain oil and protein percentages will be determined using nuclear magnetic resonance (NMR) spectroscopy. Oil fatty acid profiles were analyzed with a Shimadzu 17A gas chromatograph with a flame ionization detector (FID).

Good stand establishment was obtained. Flowering began between June 12 and 16 and maturity was reached between July 25 and 27. Seed yields ranged from 866 – 1151 lbs/acre, with no significant differences among cultivars (Table 1). Test weights did differ among cultivars, ranging from 49.5 to 52.5 lbs/bushel. The only significant differences in fatty acid content were observed in the oleic and linoleic profiles (Table 2).

Summary: Yields were lower than in previous years, perhaps due to the late planting date and dry sandy soil at the location.

Table 1. Agronomic data for 16 camelina cultivars at Kalispell in 2008.

Entry	Plant Count	1st Flower	PlantHt	Lodging		Maturity	Yield	Moisture	TestWt
	#/3'	date	inches	sev(1-5)*	%plot	date	lbs/a	%	lbs/bu
Blaine Creek	14.7	6/16	35	1.0	4	7/25	998	7.8	**51.4**
GP48	14.4	6/13	39	1.0	1	7/25	1006	7.5	**51.8**
GP67	16.0	6/14	37	1.3	4	7/25	874	8.0	**51.2**
SO-2	8.4	6/16	38	1.0	0	7/25	981	7.8	**51.9**
GP69	12.0	6/16	37	1.5	4	7/25	881	8.3	49.5
SO-1	10.8	6/14	36	1.0	1	7/26	882	8.0	**51.6**
SO-4	8.1	6/13	34	1.8	10	7/27	886	8.0	**51.5**
GP42	13.6	6/16	37	1.0	5	7/25	951	7.3	**51.7**
Calena	13.7	6/16	38	1.8	4	7/25	1151	8.4	**51.6**
Ligena	11.4	6/15	38	1.8	10	7/25	975	8.1	**51.4**
SO-5	9.0	6/15	37	1.0	2	7/25	1017	7.9	**51.5**
GP07	12.9	6/12	36	1.3	1	7/25	866	7.8	50.6
SO-3	14.4	6/14	39	1.5	5	7/25	896	7.8	**51.3**
SO-6	12.4	6/15	38	1.0	0	7/25	1038	8.1	50.9
Suneson	21.8	6/14	38	1.0	3	7/25	904	7.8	**52.5**
GP11	13.9	6/13	38	1.0	3	7/25	950	7.6	**51.8**
mean	13.0		37	1.2	4		953	7.9	51.4
Pr>F	0.1135		0.1587	0.4650	0.6718		0.6773	0.7350	0.0480
LSD(0.05)	NS		NS	NS	NS		NS	NS	1.4
CV %	40.4		6.2	49.9	190.3		18.3	8.5	1.9

*1=upright; 5=flat

Table 2. Analysis of 7 fatty acids in camelina oils produced at Kalispell in 2008.

GC%

Entry	Palmitic C16:0	Stearic C18:0	Oleic C18:1	Linoleic C18:2	Linolenic C18:3	Eicosenoic C20:1	Erucic C22:1
Blaine Creek	5.32	2.23	**15.93**	16.41	37.41	12.92	1.81
GP48	5.44	2.06	14.80	**18.18**	38.55	12.58	1.99
GP67	5.55	2.21	**15.79**	**18.43**	38.55	12.08	1.74
SO-2	5.30	2.24	15.06	**18.27**	37.27	13.37	2.08
GP69	5.42	2.13	15.27	**17.96**	38.04	13.01	1.97
SO-1	4.03	2.23	15.29	17.47	37.32	13.72	2.25
SO-4	5.49	2.34	**15.37**	**18.11**	35.91	14.09	2.31
GP42	5.57	2.27	15.03	**18.20**	37.24	13.26	2.06
Calena	5.47	2.15	14.44	17.38	37.90	13.49	2.32
Ligena	5.70	2.15	15.31	**18.95**	37.38	12.64	1.99
SO-5	5.45	2.18	15.25	17.82	36.82	13.88	2.30
GP07	5.61	2.14	15.31	17.50	39.00	12.55	1.85
SO-3	5.41	2.28	**15.70**	17.61	36.64	13.74	2.26
SO-6	5.54	2.27	**16.16**	16.50	37.59	13.66	2.18
Suneson	5.57	2.24	**15.37**	17.82	38.55	12.78	1.89
GP11	5.52	2.23	14.85	17.60	38.87	12.50	1.98
mean	5.40	2.21	15.31	17.76	37.69	13.14	2.06
Pr>F	0.47	0.2943	0.0362	0.0034	0.2400	0.1032	0.1386
SE	0.7714	0.1119	0.5240	0.7061	1.1790	0.7844	0.2667
LSD(0.05)	NS	NS	0.83	1.12	NS	NS	NS

Project Title: 2008 Statewide Lentil Evaluations

Project Leader: Chengci Chen, CARC

Cooperator: Louise Strang, NWARC

Objective: Compare the production of 10 lentil (*Lens culinaris*) cultivars in a northwestern Montana environment.

Results:

Ten lentil cultivars, treated with Apron-Maxx RTA, were seeded at 7 seeds/sq.ft. on April 14, 2008. The soil was a Creston silt loam previously cropped to barley and prepared by minimum tillage. Fertilizer containing 11 lbs N/acre and 52 lbs P_2O_5/acre was incorporated prior to seeding. Prowl, at 4 pints/acre, was pre-plant incorporated for broadleaf weed control. The lentils were direct harvested with a plot combine between Aug. 11 and 13, 2008.

The lentils reached 50% flowering between June 21 and 23 and were mature (13-15% moisture) between July 29 and Aug. 6, 2008. Yields ranged from 1844 lbs/a ('Brewer') to 2676 lbs/a ('LC01602300R'). The smallest variety was 'Crimson' with 12971 seeds/lb., and the largest was 'Riveland' with 5690 seeds/lb (Table 1).

Summary: The highest yielding lentil cultivars were 'Merrit' and experimental Eston-, Pennell-, and Riveland-types.

Table 1. Results of the Statewide Lentil Evaluation at Kalispell in 2008.

Cultivar	50% Flower *date*	Canopy Ht. *in*	Grain Maturity *date*	Yield *lbs/a*	SeedWT *#/lb*
Vantage	6/23	17	8/5	2089	8668
Brewer	6/21	**18**	8/2	1844	7276
Crimson	6/23	14	7/29	2309	**12971**
Merrit	6/21	16	8/3	**2445**	6486
Pennell	6/22	16	8/3	2256	6503
Riveland	6/22	**18**	8/6	2046	5690
LC1602307E	6/23	**19**	8/6	**2670**	9332
LC01602062T	6/22	16	8/4	2310	9080
LC01602245P	6/21	15	8/2	**2477**	11035
LC01602300R	6/22	16	8/3	**2676**	9080
mean		16		2312	8612
Pr>F		0.0001		<.0001	<.0001
LSD(0.05)		2		270	548
CV%		7.0		8.1	4.3

Project Title: 2008 Statewide Dry Pea Evaluations

Project Leader: Chengci Chen, CARC

Cooperator: Louise Strang, NWARC

Objective: Compare the production of 10 dry pea (*Pisum sativum* L.) cultivars in a northwestern Montana environment.

Results:

Ten dry pea cultivars, treated with Apron-Maxx RTA, were seeded at 7 seeds/sq.ft. on April 14, 2008. All peas in the trial were of the semi-dwarf/semi-leafless type. The soil was a Creston silt loam previously cropped to barley and prepared by minimum tillage. Fertilizer containing 11 lbs N/acre and 52 lbs P_2O_5/acre was incorporated prior to seeding. Prowl, at 4 pints/acre, was pre-plant incorporated for broadleaf weed control. The peas were direct harvested with a plot combine between Aug. 1 and 4, 2008.

The peas reached first bloom between June 20 and 26 and were physiologically mature between July 25 and 27, 2008. Yields ranged from 2724 lbs/a ('Cruiser') to 3633 lbs/a ('Delta'). The smallest variety was 'Medora' with 2102 seeds/lb., and the largest was 'PS0010836' with 1683 seeds/lb (Table 1).

Summary: The highest yielding pea cultivars were 'Admiral', 'Delta', 'Stirling', and experimental PS0010836.

Table 1. Results of the Statewide Dry Pea Evaluation at Kalispell in 2008.

Cultivar	1st Flower *date*	Nodes *to 1st fl*	Canopy Ht. *in*	Maturity *date*	Grain Yield *lbs/a*	Seed Size *#/lb*
Majoret	6/25	12	25.2	7/27	3242	**2009**
Admiral	6/24	**14**	28.0	7/25	**3398**	1734
Delta	6/23	13	25.6	7/25	**3633**	1724
Mozart	6/23	11	24.3	7/26	3207	1908
Cruiser	6/23	13	28.0	7/25	2724	**2005**
Stirling	6/20	10	22.7	7/27	**3281**	**2048**
Medora	6/26	13	**31.0**	7/27	2885	**2102**
PS01102958	6/25	12	21.8	7/25	3162	1732
PS9910140	6/24	12	23.5	7/27	3188	1891
PS0010836	6/23	11	23.4	7/25	**3473**	1683
mean		12	25.3		3219	1883
Pr>F		<.0001	<.0001		<.0001	<.0001
LSD(0.05)		1	2.3		398	117
CV%		6.6	6.4		8.6	4.3

Project Title: Camelina Yield Evaluation Trial

Project Leader: Fernando Guillen-Portal, WestBred, LLC

Project Personnel: Louise Strang, Bob Stougaard, NWARC

Objective: To evaluate 6 breeding lines of camelina (*Camelina sativa* L. Crantz) for yield in northwestern Montana.

Results:

Six camelina cultivars were submitted by Sustainable Oils, Inc. in order to evaluate yield and oil quality from large unreplicated strip plots. The previous crop was barley and the study was conducted with conventional tillage practices. The area was fertilized with 11-52-0 and prowl was applied ppi on 4/4/08 at 1 lb ai/a to suppress weeds. The cultivars were seeded at 3 lbs/a as individual 2000 ft^2 plots on 4/9/08.

Plant densities (plants/linear foot) were determined on 4/24/08 and varied almost two fold among the entries. Although all entries were seeded at the same density, stand counts ranged from a low of 2.2 for SO-2 to a high of 4.3 plants/ft for SO-1 and SO3. Nevertheless, the cultivars appeared to be able to compensate, and yields were not directly related to plant population.

On average, camelina reach the 50 percent bloom stage on 6/12/08, despite the late planting date and the cool growing conditions. Fifty percent bloom ranged from 6/9/08 to 6/13/08. Days to maturity among entries were slightly more compressed than that for percent bloom. Seed pods appeared brown and mature between 7/25/08 and 7/28/08. No shattering was observed.

Insect larvae and pupae were observed on all plots in early July. The larvae appeared to be a type of looper and were approximately an inch long, pale green with brown dorsal stripes. The pupae were attached to the stems by fibrous encasements with many larvae eventually appearing black and dead. This was especially evident for SO-3, and may be a result of some form of antibiosis. However, it should be noted that this same entry had the highest pupae density to begin with. There was no apparent chewing damage on the leaves. Aside from this insect infestation, the plants appeared healthy and disease free during the entire season.

Plant height averaged 40 inches and ranged from 37 inches for SO-3 to 45 inches for SO-2. Lodging was not extensive, but tended to be more severe for SO-2, SO-3, and SO-4. The plots were direct combined on 8/7/08. Yields averaged 1829 lb/a, and ranged from 1606 lbs/a for SO-5 to 2124 lbs/a for SO-1. Test weights averaged 52 lb/bu and ranged from 50.1 lbs/bu ('SO-6') to 52.8 lbs/bu (SO-3). Seed moisture averaged 7 percent and ranged from 6.7 % for SO-3 to 8.2 % for SO-6.

CAMELINA YIELD EVALUATION TRIAL
Kalispell - 2008

				7/9		7/15				
		Bloom	Maturity	Pupae		Pupae		Lodging		Height
Cultivar	Plts/lin. ft	day of year		live	dead	live	dead	sev(1-5)	%plot	inches
SO-1	4.3	6/12	7/28	99	63	191	31	1	5	38
SO-2	2.2	6/13	7/28	90	21	211	45	2	20	45
SO-3	4.3	6/13	7/25	135	30	245	130	2	20	37
SO-4	3.7	6/9	7/28	125	37	226	75	3	15	40
SO-5	3.2	6/13	7/28	128	23	138	61	2	3	39
SO-6	3.6	6/13	7/25	84	16	146	73	1	1	42
Avg	**3.6**	**6/12**	**7/27**	**110**	**32**	**193**	**69**	**2**	**11**	**40**

	Yield	TWT	Moisture
Cultivar	lb/ac	lbs/bu	%
SO-1	2124	51.2	7.1
SO-2	2015	52.7	7.9
SO-3	1702	52.8	6.7
SO-4	1729	51.7	7.6
SO-5	1606	51.7	7.3
SO-6	1797	50.1	8.2
Avg	**1829**	**52**	**7**