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

SPECIAL
ANNUAL REPORT
2011 CROP YEAR

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

Summary of Climatic Data by Months for the 2011 Crop Year: September 2010 - August 2011
and Averages for the Years 1980-2011 at the
Northwestern Agricultural Research Center, Kalispell, Montana

	Sept. 2010	Oct. 2010	Nov. 2010	Dec. 2010	Jan. 2011	Feb. 2011	Mar. 2011	Apr. 2011	May 2011	June 2011	July 2011	Aug. 2011	Total or Average
Precipitation (inches)													
Current Year	1.71	0.74	2.77	1.69	2.43	1.61	0.87	2.25	3.20	4.48	0.99	0.24	22.98
1980-2010	1.61	1.27	1.60	1.53	1.40	1.19	1.29	1.84	2.45	3.26	1.67	1.12	20.23
Average Temperature (F°)													
Current Year	51.9	43.9	29.0	23.8	24.3	19.5	34.7	38.7	48.7	53.5	61.9	64.4	41.2
1980-2010	53.6	42.2	32.4	24.0	24.5	27.0	34.8	43.0	51.3	57.5	64.3	63.4	43.2
Last killing frost[1] in spring													
Spring 2011					May 18	29°F							
Median for 1980-2010					May 20								
First killing frost[1] in fall													
Fall 2011					September 29								
Median for 1980-2011					September 17								
Frost Free Period													
Avg. 1980-2011					128								
Growing Degree Days April - August 2011													
Base 50					1218.5								
Base 40					2151.0								
Base 32					3151.0								
Maximum summer temperature					89	Aug. 22, 2011							
Minimum winter temperature					-16	Feb 1 & 2, 2011							

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

MAXIMUM / MINIMUM TEMPERATURES BY MONTH & DAY
JANUARY 2007- DECEMBER 2011

2011

YR	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	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	8	-5	10	-16	37	27	52	40	46	31	65	42	65	45	83	49	72	44	72	34				
2	13	5	10	-16	33	23	46	35	53	31	65	42	68	41	84	49	M	M	68	43				
3	17	12	13	-1	37	26	43	25	61	36	51	39	77	46	83	48	68	34	70	37				
4	19	13	21	9	43	29	44	26	48	37	51	33	78	47	84	48	69	34	70	37				
5	23	15	36	21	38	23	41	34	58	31	68	38	77	46	M	M	75	38	55	42				
6	37	22	41	19	38	16	47	32	58	35	75	46	79	46	79	48	80	40	53	44				
7	39	35	31	19	39	16	45	24	56	41	77	52	82	49	81	49	81	41	54	46				
8	39	32	28	9	38	20	46	26	51	M	64	46	85	51	80	48	82	42	48	40				
9	34	15	26	0	37	30	50	24	58	37	49	44	67	42	80	48	78	43	55	30				
10	19	-5	20	8	43	29	52	26	56	30	59	47	73	42	82	46	82	42	53	30				
11	11	-10	34	20	45	35	49	38	65	35	64	44	72	45	80	44	80	41	M	M				
12	8	-10	43	28	38	19	52	30	70	38	63	44	81	48	75	45	80	45	58	41				
13	34	-9	51	36	43	21	48	25	68	34	64	47	79	54	77	46	80	46	53	40				
14	42	34	42	23	51	35	58	27	M	M	58	47	79	53	85	53	72	45	53	29				
15	43	39	44	25	46	32	47	33	73	38	63	43	69	49	84	56	73	45	42	31				
16	43	36	36	31	43	32	45	36	71	45	59	43	M	M	72	43	62	47	50	27				
17	44	37	33	27	45	32	54	32	71	39	49	43	78	44	73	40	66	44	48	28				
18	44	35	31	21	39	28	42	27	55	29	55	45	83	54	80	40	63	50	51	27				
19	38	20	27	4	47	25	42	28	67	35	64	49	87	51	74	38	60	52	53	26				
20	32	18	31	6	35	25	39	22	67	41	55	39	82	53	80	41	56	37	49	26				
21	33	24	26	14	43	28	48	23	64	42	66	M	69	43	84	46	62	34	55	34				
22	36	31	30	19	43	31	45	30	71	40	72	45	71	45	89	59	68	36	57	35				
23	41	30	34	12	38	28	45	29	65	48	81	53	79	40	78	48	78	50	53	41				
24	39	18	18	2	46	24	52	26	60	47	71	44	80	53	85	52	83	41	58	33				
25	30	18	6	-3	51	24	59	30	54	46	65	39	68	54	86	49	80	41	58	26				
26	37	30	8	-10	47	29	54	39	64	42	62	37	73	46	86	49	77	46	46	22				
27	40	21	14	-4	48	29	46	36	43	38	66	40	75	47	87	48	M	M	45	23				
28	31	20	33	10	37	29	48	35	50	M	74	40	M	M	M	M	70	46	49	22				
29	39	20			44	29	48	31	44	38	77	53	M	M	87	51	64	29	47	22				
30	41	11			43	34	36	31	61	38	76	53	M	M	75	50	67	30	52	26				
31	13	-16			51	38			63	34			85	46	81	49			53	28				
AVG	31.2	17.3	27.8	11.2	42.1	27.3	47.4	30.0	57.8	34.1	64.3	42.6	76.3	47.4	81.2	47.6	72.4	39.9	52.5	32.3	0.0	0.0	0.0	0.0

MAXIMUM TEMPERATURE °F | MINIMUM TEMPERATURE -16°F | "M": missing data

Precipitation by Day for Crop Year September 2010- August 2011

Northwest Agriculture Research Center, Kalispell Montana

DAY	SEPT. 2010	OCT. 2010	NOV. 2010	DEC. 2010	JAN. 2011	FEB. 2011	MAR. 2011	APR. 2011	MAY 2011	JUNE 2011	JULY 2011	AUG. 2011	Year to Date
1	0.06	0.00	0.10	0.20	0.01	0.00	0.08	0.03	0.32	0.18	0.01	0.00	0.99
2	0.08	0.00	0.23	0.04	0.02	0.00	0.11	0.19	0.00	0.01	0.00	0.00	0.68
3	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.10	0.08	1.80	0.00	0.00	2.24
4	0.01	0.02	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.13	0.00	0.00	0.19
5	0.00	0.12	0.00	0.00	0.28	0.03	0.00	0.12	0.00	0.00	0.00	M	0.55
6	0.15	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.21
7	0.01	0.02	0.04	0.02	0.31	0.40	0.00	0.00	0.13	0.35	0.00	0.00	1.28
8	0.00	0.00	0.28	0.02	0.21	0.01	0.00	0.00	0.30	0.25	0.13	0.00	1.20
9	0.27	0.00	0.01	0.01	0.05	0.00	0.00	0.00	0.01	0.21	0.00	0.00	0.56
10	0.11	0.00	0.30	0.33	0.0	0.01	0.01	0.00	0.00	0.00	0.00	0.22	0.98
11	0.00	0.01	0.00	0.04	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.07
12	0.00	0.00	0.03	0.20	0.12	0.00	0.00	0.04	0.00	0.08	0.07	0.00	0.54
13	0.00	0.00	0.00	0.11	0.29	0.00	0.00	0.00	0.08	0.03	0.04	0.00	0.55
14	0.00	0.00	0.01	0.09	0.02	0.00	0.00	0.38	0.00	0.28	0.45	0.00	1.23
15	0.00	0.00	0.08	0.10	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.20
16	0.04	0.00	0.78	0.00	0.11	0.51	0.16	0.04	0.34	0.14	M	0.00	2.12
17	0.27	0.00	0.28	0.00	0.14	0.04	0.00	0.06	0.10	0.31	0.00	0.00	1.20
18	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.20	0.00	0.01	0.00	0.00	0.47
19	0.06	0.00	0.03	0.08	0.00	0.00	0.00	0.13	0.00	0.15	0.00	0.00	0.45
20	0.43	0.00	0.00	0.04	0.00	0.00	0.00	0.14	0.00	0.05	0.00	0.00	0.66
21	0.00	0.00	0.01	0.04	0.01	0.00	0.10	0.05	0.00	0.04	0.00	0.00	0.25
22	0.20	0.00	0.20	0.00	0.20	0.00	0.01	0.06	0.00	0.00	0.23	0.00	0.90
23	0.00	0.00	0.10	0.00	0.01	0.17	0.02	0.00	0.06	0.03	0.00	0.00	0.39
24	0.01	0.05	0.10	0.00	0.00	0.04	0.00	0.00	0.13	0.24	0.01	0.00	0.58
25	0.01	0.22	0.01	0.00	0.34	0.00	0.00	0.04	0.18	0.00	0.02	0.00	0.82
26	0.00	0.18	0.01	0.00	0.00	0.00	0.18	0.01	0.45	0.00	0.00	0.00	0.83
27	0.00	0.07	0.01	0.05	0.00	0.10	0.00	0.05	0.43	0.00	0.00	0.00	0.71
28	0.00	0.00	0.01	0.06	0.00	0.00	0.00	0.25	0.25	0.00	M	0.00	0.57
29	0.00	0.05	0.14	0.00	0.00		0.07	0.05	0.32	0.00	M	0.00	0.63
30	0.00	0.09	0.01	0.00	0.27		0.01	0.31	0.00	0.19	M	0.00	0.88
31		0.05		0.00	0.01		0.10		0.00		0.03	0.00	0.19
TOTAL	1.71	0.88	2.77	1.69	2.43	1.61	0.87	2.25	3.20	4.48	0.99	0.24	23.12

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	0.24	21.52
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
2008-09	1.57	0.61	1.71	2.37	1.72	1.59	1.43	0.98	1.62	1.98	2.44	0.99	19.01
2009-10	0.04	1.72	0.37	2.66	1.42	0.66	0.72	3.47	2.45	5.03	1.25	1.35	21.14
2010-11	1.71	0.74	2.77	1.69	2.43	1.61	0.87	2.25	3.20	4.48	0.99	0.24	22.98
MEAN	1.61	1.27	1.60	1.53	1.40	1.19	1.29	1.84	2.45	3.26	1.67	1.12	20.23
	SEPT	OCT	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	TOTAL

Mean precipitation for all crop years = 1.69

Summary of precipitation records at the Northwestern Agricultural Research Center

Total Precipitation (inches) by Months and Years

DATE	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1981	1.81	1.85	2.17	1.75	3.86	4.70	1.17	0.96	0.77	0.56	1.49	1.91	23.00
1982	2.38	1.48	1.16	1.60	1.25	2.41	2.06	1.17	2.37	0.75	1.39	1.60	19.62
1983	0.93	0.85	1.71	2.41	1.20	2.96	3.66	1.16	1.70	1.13	1.96	2.57	22.24
1984	0.80	2.19	1.81	1.93	2.91	2.07	0.31	0.55	2.15	2.25	1.40	1.29	19.66
1985	0.31	1.28	0.90	1.31	2.81	1.89	0.35	1.62	5.35	1.55	1.61	0.51	19.49
1986	2.39	2.33	0.50	1.34	2.92	1.83	2.09	0.81	3.63	0.80	1.78	0.63	21.05
1987	0.38	0.46	3.47	1.15	1.89	1.95	4.85	0.98	0.81	0.12	0.91	1.18	18.15
1988	0.98	1.03	0.77	1.36	3.60	1.98	1.07	0.13	2.30	0.62	1.39	1.69	16.92
1989	1.39	1.48	2.29	1.09	2.70	2.05	2.70	3.69	1.50	2.29	3.75	1.92	26.85
1990	0.96	1.00	1.76	1.63	3.74	2.68	2.34	2.44	T	2.32	1.37	2.60	22.84
1991	1.41	0.41	0.72	1.21	2.72	5.36	0.77	1.15	0.80	0.75	2.26	0.58	18.14
1992	1.17	0.61	0.83	1.18	1.65	5.34	2.24	0.94	1.21	1.07	2.37	1.53	20.14
1993	1.68	0.60	0.73	3.77	2.22	4.00	7.00	1.19	1.54	0.83	1.23	1.27	26.06
1994	1.43	1.49	0.11	2.01	1.79	2.59	0.10	0.23	0.46	2.12	1.89	1.07	15.29
1995	1.17	0.90	2.33	2.25	1.44	5.63	1.91	1.47	1.21	2.75	2.33	1.91	25.30
1996	2.22	1.18	1.19	3.32	4.58	2.05	0.95	0.80	2.67	1.58	3.99	3.52	28.05
1997	1.50	1.62	1.18	1.69	2.62	3.41	0.99	1.94	2.36	0.94	0.33	0.42	19.00
1998	0.77	0.33	2.64	1.80	5.14	4.64	1.18	0.72	1.48	0.71	1.11	1.47	21.99
1999	1.05	1.18	0.90	0.55	1.32	2.74	1.63	1.93	0.36	1.72	2.33	1.08	16.79
2000	1.46	1.81	1.30	2.21	0.89	1.80	0.84	0.35	1.40	0.62	0.46	1.23	14.37
2001	0.75	1.54	1.03	2.62	0.57	3.29	0.91	0.54	0.32	1.80	1.44	0.59	15.40
2002	1.21	1.66	1.48	0.91	2.72	2.39	1.45	1.44	1.18	0.25	0.87	1.67	17.23
2003	1.63	1.01	2.32	2.23	1.78	1.57	0.05	0.35	2.56	1.29	0.59	1.04	16.42
2004	2.02	0.42	0.57	2.23	1.97	1.31	1.24	3.60	1.89	1.62	0.84	1.49	19.20
2005	2.46	0.01	1.41	2.21	1.73	8.44	0.26	0.60	2.28	2.20	1.45	1.42	24.47
2006	3.04	1.10	0.55	2.12	2.89	5.50	0.51	0.71	1.95	1.10	2.28	0.24	21.99
2007	0.39	2.26	0.54	1.62	3.29	1.35	0.75	0.23	1.28	1.11	1.02	1.13	14.97
2008	1.31	0.76	0.61	0.90	2.33	3.65	3.80	1.15	1.57	0.61	1.71	2.37	20.77
2009	1.72	1.59	1.43	0.98	1.62	1.98	2.44	0.99	0.04	1.72	0.37	2.66	17.54
2010	1.42	0.66	0.72	3.47	2.45	5.03	1.25	1.35	1.71	0.74	2.77	1.69	23.26
2011	2.43	1.61	0.87	2.25	3.20	4.48	0.99	0.24	0.91	2.46			19.44
MEAN	1.44	1.18	1.29	1.84	2.45	3.26	1.67	1.14	1.61	1.30	1.62	1.48	20.18
DATE	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL

YEAR 2011 - GROWING DEGREE DAYS JANUARY THROUGH OCTOBER
CALCULATED AT BASE 50, BASE 40, AND BASE 32

Page 1: January - May

JANUARY

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	8	-5	0.0	0.0	0.0
2	13	5	0.0	0.0	0.0
3	17	12	0.0	0.0	0.0
4	19	13	0.0	0.0	0.0
5	23	15	0.0	0.0	0.0
6	37	22	0.0	0.0	2.5
7	39	35	0.0	0.0	5.0
8	39	32	0.0	0.0	3.5
9	34	15	0.0	0.0	1.0
10	19	-5	0.0	0.0	0.0
11	11	-10	0.0	0.0	0.0
12	8	-10	0.0	0.0	0.0
13	34	-9	0.0	0.0	1.0
14	42	34	0.0	1.0	6.0
15	43	39	0.0	1.5	9.0
16	43	36	0.0	1.5	7.5
17	44	37	0.0	2.0	8.5
18	44	35	0.0	2.0	7.5
19	38	20	0.0	0.0	3.0
20	32	18	0.0	0.0	0.0
21	33	24	0.0	0.0	0.5
22	36	31	0.0	0.0	2.0
23	41	30	0.0	0.5	4.5
24	39	18	0.0	0.0	3.5
25	30	18	0.0	0.0	0.0
26	37	30	0.0	0.0	2.5
27	40	21	0.0	0.0	4.0
28	31	20	0.0	0.0	0.0
29	39	20	0.0	0.0	3.5
30	41	11	0.0	0.5	4.5
31	13	-16	0.0	0.0	0.0
	AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
	31.8	17.9	0.0	9.0	79.5

February

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	10	-16	0.0	0.0	0.0
2	10	-16	0.0	0.0	0.0
3	13	-1	0.0	0.0	0.0
4	21	9	0.0	0.0	0.0
5	36	21	0.0	0.0	2.0
6	41	19	0.0	0.5	4.5
7	31	19	0.0	0.0	0.0
8	28	9	0.0	0.0	0.0
9	26	0	0.0	0.0	0.0
10	20	8	0.0	0.0	0.0
11	34	20	0.0	0.0	1.0
12	43	28	0.0	1.5	5.5
13	51	36	0.5	5.5	11.5
14	42	23	0.0	1.0	5.0
15	44	25	0.0	2.0	6.0
16	36	31	0.0	0.0	2.0
17	33	27	0.0	0.0	0.5
18	31	21	0.0	0.0	0.0
19	27	4	0.0	0.0	0.0
20	31	6	0.0	0.0	0.0
21	26	14	0.0	0.0	0.0
22	30	19	0.0	0.0	0.0
23	34	12	0.0	0.0	1.0
24	18	2	0.0	0.0	0.0
25	6	-3	0.0	0.0	0.0
26	8	-10	0.0	0.0	0.0
27	14	-4	0.0	0.0	0.0
28	33	10	0.0	0.0	0.5
	AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
	25.9	10.4	0.5	10.5	39.5

March

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	37	27	0.0	0.0	2.5
2	33	23	0.0	0.0	0.5
3	37	26	0.0	0.0	2.5
4	43	29	0.0	1.5	5.5
5	38	23	0.0	0.0	3.0
6	38	16	0.0	0.0	3.0
7	39	16	0.0	0.0	3.5
8	38	20	0.0	0.0	3.0
9	37	30	0.0	0.0	2.5
10	43	29	0.0	1.5	5.5
11	45	35	0.0	2.5	8.0
12	38	19	0.0	0.0	3.0
13	43	21	0.0	1.5	5.5
14	51	35	0.5	5.5	11.0
15	46	32	0.0	3.0	7.0
16	43	32	0.0	1.5	5.5
17	45	32	0.0	2.5	6.5
18	39	28	0.0	0.0	3.5
19	47	25	0.0	3.5	7.5
20	35	25	0.0	0.0	1.5
21	43	28	0.0	1.5	5.5
22	43	31	0.0	1.5	5.5
23	38	28	0.0	0.0	3.0
24	46	24	0.0	3.0	7.0
25	51	24	0.5	5.5	9.5
26	47	29	0.0	3.5	7.5
27	48	29	0.0	4.0	8.0
28	37	29	0.0	0.0	2.5
29	44	29	0.0	2.0	6.0
30	43	34	0.0	1.5	6.5
31	51	38	0.5	5.5	12.5
	AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
	42.1	27.3	1.5	51.0	164.0

April

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	52	40	1.0	6.0	14.0
2	46	35	0.0	3.0	8.5
3	43	25	0.0	1.5	5.5
4	44	26	0.0	2.0	6.0
5	41	34	0.0	0.5	5.5
6	47	32	0.0	3.5	7.5
7	45	24	0.0	2.5	6.5
8	46	26	0.0	3.0	7.0
9	50	24	0.0	5.0	9.0
10	52	26	1.0	6.0	10.0
11	49	38	0.0	4.5	11.5
12	52	30	1.0	6.0	10.0
13	48	25	0.0	4.0	8.0
14	58	27	4.0	9.0	13.0
15	47	33	0.0	3.5	8.0
16	45	36	0.0	2.5	8.5
17	54	32	2.0	7.0	11.0
18	42	27	0.0	1.0	5.0
19	42	28	0.0	1.0	5.0
20	39	22	0.0	0.0	3.5
21	48	23	0.0	4.0	8.0
22	45	30	0.0	2.5	6.5
23	45	29	0.0	2.5	6.5
24	52	26	1.0	6.0	10.0
25	59	30	4.5	9.5	13.5
26	54	39	2.0	7.0	14.5
27	46	36	0.0	3.0	9.0
28	48	35	0.0	4.0	9.5
29	48	31	0.0	4.0	8.0
30	36	31	0.0	0.0	2.0
	AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
	47.4	30.0	16.5	114.0	250.5

May

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	46	31	0.0	3.0	7.0
2	53	31	1.5	6.5	10.5
3	61	36	5.5	10.5	16.5
4	48	37	0.0	4.0	10.5
5	58	31	4.0	9.0	13.0
6	58	35	4.0	9.0	14.5
7	56	41	3.0	8.5	16.5
8	51	M	0.5	5.5	9.5
9	58	37	4.0	9.0	15.5
10	56	30	3.0	8.0	12.0
11	65	35	7.5	12.5	18.0
12	70	38	10.0	15.0	22.0
13	68	34	9.0	14.0	19.0
14	M	M	0.0	0.0	0.0
15	73	38	11.5	16.5	23.5
16	71	45	10.5	18.0	26.0
17	71	39	10.5	15.5	23.0
18	55	29	2.5	7.5	11.5
19	67	35	8.5	13.5	19.0
20	67	41	8.5	14.0	22.0
21	64	42	7.0	13.0	21.0
22	71	40	10.5	15.5	23.5
23	65	48	7.5	16.5	24.5
24	60	47	5.0	13.5	21.5
25	54	46	2.0	10.0	18.0
26	64	42	7.0	13.0	21.0
27	43	38	0.0	1.5	8.5
28	50	M	0.0	5.0	9.0
29	44	38	0.0	2.0	9.0
30	61	38	5.5	10.5	17.5
31	63	34	6.5	11.5	16.5
	AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
	57.8	34.1	155.0	311.5	499.5

YEAR 2011 - GROWING DEGREE DAYS JANUARY THROUGH OCTOBER 2010

CALCULATED AT BASE 50, BASE 40, AND BASE 32

Page 2: June - October

JUNE

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	65	42	7.5	13.5	21.5
2	65	42	7.5	13.5	21.5
3	51	39	0.5	5.5	13.0
4	51	33	0.5	5.5	10.0
5	68	38	9.0	14.0	21.0
6	75	46	12.5	20.5	28.5
7	77	52	14.5	24.5	32.5
8	64	46	7.0	15.0	23.0
9	49	44	0.0	6.5	14.5
10	59	47	4.5	13.0	21.0
11	64	44	7.0	14.0	22.0
12	63	44	6.5	13.5	21.5
13	64	47	7.0	15.5	23.5
14	58	47	4.0	12.5	20.5
15	63	43	6.5	13.0	21.0
16	59	43	4.5	11.0	19.0
17	49	43	0.0	6.0	14.0
18	55	45	2.5	10.0	18.0
19	64	49	7.0	16.5	24.5
20	55	39	2.5	7.5	15.0
21	66	"M"	8.0	13.0	17.0
22	72	45	11.0	18.5	26.5
23	81	53	17.0	27.0	35.0
24	71	44	10.5	17.5	25.5
25	65	39	7.5	12.5	20.0
26	62	37	6.0	11.0	17.5
27	66	40	8.0	13.0	21.0
28	74	40	12.0	17.0	25.0
29	77	53	15.0	25.0	33.0
30	76	53	14.5	24.5	32.5
	AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
	64.3	42.6	220.5	430.0	658.5

JULY

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	65	45	7.5	15.0	23.0
2	68	41	9.0	14.5	22.5
3	77	46	13.5	21.5	29.5
4	78	47	14.0	22.5	30.5
5	77	46	13.5	21.5	29.5
6	79	46	14.5	22.5	30.5
7	82	49	16.0	25.5	33.5
8	85	51	18.0	28.0	36.0
9	67	42	8.5	14.5	22.5
10	73	42	11.5	17.5	25.5
11	72	45	11.0	18.5	26.5
12	81	48	15.5	24.5	32.5
13	79	54	16.5	26.5	34.5
14	79	53	16.0	26.0	34.0
15	69	49	9.5	19.0	27.0
16	"M"	"M"	0.0	0.0	0.0
17	78	44	14.0	21.0	29.0
18	83	54	18.5	28.5	36.5
19	87	51	18.5	28.5	36.5
20	82	53	17.5	27.5	35.5
21	69	43	9.5	16.0	24.0
22	71	45	10.5	18.0	26.0
23	79	40	14.5	19.5	27.5
24	80	53	16.5	26.5	34.5
25	68	54	11.0	21.0	29.0
26	73	46	11.5	19.5	27.5
27	75	47	12.5	21.0	29.0
28	"M"	"M"	0.0	0.0	0.0
29	"M"	"M"	0.0	0.0	0.0
30	"M"	"M"	0.0	0.0	0.0
31	85	46	17.5	25.5	33.5
	AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
	76.3	47.4	366.5	590.0	806.0

AUGUST

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	83	49	16.5	26.0	34.0
2	84	49	17.0	26.5	34.5
3	83	48	16.5	25.5	33.5
4	84	48	17.0	26.0	34.0
5	M	M	0.0	0.0	0.0
6	79	48	14.5	23.5	31.5
7	81	49	15.5	25.0	33.0
8	80	48	15.0	24.0	32.0
9	80	48	15.0	24.0	32.0
10	82	46	16.0	24.0	32.0
11	80	44	15.0	22.0	30.0
12	75	45	12.5	20.0	28.0
13	77	46	13.5	21.5	29.5
14	85	53	19.0	29.0	37.0
15	84	56	20.0	30.0	38.0
16	72	43	11.0	17.5	25.5
17	73	40	11.5	16.5	24.5
18	80	40	15.0	20.0	28.0
19	74	38	12.0	17.0	24.0
20	80	41	15.0	20.5	28.5
21	84	46	17.0	25.0	33.0
22	89	59	22.5	32.5	40.5
23	78	48	14.0	23.0	31.0
24	85	52	18.5	28.5	36.5
25	86	49	18.0	27.5	35.5
26	86	49	18.0	27.5	35.5
27	87	48	18.0	27.0	35.0
28	M	M	0.0	0.0	0.0
29	87	51	18.5	28.5	36.5
30	75	50	12.5	22.5	30.5
31	81	49	15.5	25.0	33.0
	AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
	81.2	47.6	460.0	705.5	936.5

SEPTEMBER

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	72	44	11.0	18.0	26.0
2	M	M	0.0	0.0	0.0
3	68	34	9.0	14.0	19.0
4	69	34	9.5	14.5	19.5
5	75	38	12.5	17.5	24.5
6	80	40	15.0	20.0	28.0
7	81	41	15.5	21.0	29.0
8	82	42	16.0	22.0	30.0
9	78	43	14.0	20.5	28.5
10	82	42	16.0	22.0	30.0
11	80	41	15.0	20.5	28.5
12	80	45	15.0	22.5	30.5
13	80	46	15.0	23.0	31.0
14	72	45	11.0	18.5	26.5
15	73	45	11.5	19.0	27.0
16	62	47	6.0	14.5	22.5
17	66	44	8.0	15.0	23.0
18	63	50	6.5	16.5	24.5
19	60	52	6.0	16.0	24.0
20	56	37	3.0	8.0	14.5
21	62	34	6.0	11.0	16.0
22	68	36	9.0	14.0	20.0
23	78	50	14.0	24.0	32.0
24	83	41	16.5	22.0	30.0
25	80	41	15.0	20.5	28.5
26	77	46	13.5	21.5	29.5
27	M	M	0.0	0.0	0.0
28	70	46	10.0	18.0	26.0
29	64	29	7.0	12.0	16.0
30	67	30	8.5	13.5	17.5
	AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
	72.4	39.9	315.0	499.5	702.0

OCTOBER

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	72	34	11.0	16.0	21.0
2	68	43	9.0	15.5	23.5
3	70	37	10.0	15.0	21.5
4	70	37	10.0	15.0	21.5
5	55	42	2.5	8.5	16.5
6	53	44	1.5	8.5	16.5
7	54	46	2.0	10.0	18.0
8	48	40	0.0	4.0	12.0
9	55	30	2.5	7.5	11.5
10	53	30	1.5	6.5	10.5
11	M	M	0.0	0.0	0.0
12	58	41	4.0	9.5	17.5
13	53	40	1.5	6.5	14.5
14	53	29	1.5	6.5	10.5
15	42	31	0.0	1.0	5.0
16	50	27	0.0	5.0	9.0
17	48	28	0.0	4.0	8.0
18	51	27	0.5	5.5	9.5
19	53	26	1.5	6.5	10.5
20	49	26	0.0	4.5	8.5
21	55	34	2.5	7.5	12.5
22	57	35	3.5	8.5	14.0
23	53	41	1.5	7.0	15.0
24	58	33	4.0	9.0	13.5
25	58	26	4.0	9.0	13.0
26	46	22	0.0	3.0	7.0
27	45	23	0.0	2.5	6.5
28	49	22	0.0	4.5	8.5
29	47	22	0.0	3.5	7.5
30	52	26	1.0	6.0	10.0
31	53	28	1.5	6.5	10.5
	AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
	54.0	32.3	77.0	222.5	383.5

CEREALS

Project Title: Evaluation of Intrastate Barley Cultivars - 2011

Project Leader: Bob Stougaard

Project personnel: Tom Blake and Stan Bates, PSPP, Bozeman

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

Materials and Methods:

The previous crop was alfalfa and the field was fertilized with 150-30-120-24 lb/A of N-P-K-S, respectively, on April 27. The soil type was a Creston silt loam (25-50-25) with an organic matter content of 4% and a pH of 7.5. Treatments were seeded 1.5 inches deep on May 6. Individual plots consisted of seven, 6-in wide rows, 15 feet in length with each variety replicated 3 times in a randomized complete block design. Wolverine was applied at 1.7 pt/A on May 25 for weed control. The study was harvested September 28. Grain yield, protein, test weight and percent plump were then determined.

The average Julian heading date for the nursery was 190 (July 8). Yields averaged 110 bu/A which is below long term averages. Yields ranged from a high of 127 bu/A for MT090182 to a low of 55 bu/A for Karma. Proteins averaged 14.1 % and ranged from a low of 12.3 for MT070175 to a high of 16.7 for Karma. Test weights were good, averaging 51.8 lb/bu and ranging from a low of 49.2 for Tradition to a high of 54.3 for Karma. Plant height averaged 35 inches, with Pinnacle being the tallest entry at 40 inches and MT070086 the shortest at 27 inches. Lodging occurred in most entries and averaged 30% for the nursery. EM090081 had the worst lodging (61%), while MT070161, MT080081, and Amsterdam had 0% lodging. Percent plumps were good and averaged 91 percent. MT030042 had the lowest plump value at 74% while MT070086 had the highest value (97.7%).

Summary:

Champion, Conrad, and Amsterdam were the highest yielding commercial varieties. Lodging continues to be a serious production problem in barley.

Table 1. Agronomic data from the intrastate barley nursery grown at Kalispell, MT during 2011.
Planted: May 6, 2011 Harvested: September 28, 2011

Cultivar	Yield (bu/A)	Protein (%)	Test wt. (lb/bu)	Plump (%)	Heading (Julian)	Height (inches)	Lodging (%)
MT090182	127.2	12.8	52.5	93.4	190.3	37.3	44.3
MT090229	126.9	13.1	52.3	94.4	186.7	36.9	24.3
MT070111	123.7	15.0	52.4	92.8	191.7	39.0	57.7
Champion	122.5	14.1	51.8	88.0	187.7	37.9	46.0
MT090186	122.4	12.9	51.8	92.8	191.3	37.7	30.7
MT090193	122.4	13.8	51.7	92.3	191.3	38.8	32.3
Conrad	122.2	15.8	51.6	88.1	190.3	33.6	36.7
MT080279	121.9	13.9	53.4	94.3	186.0	34.4	18.0
MT090190	121.5	13.1	52.4	92.9	189.7	38.8	31.3
MT070125	120.7	14.4	53.9	94.4	191.0	37.7	16.7
MT080285	120.6	14.2	52.3	94.8	187.3	32.4	9.3
MT020162	120.3	14.2	51.5	91.9	191.3	36.2	16.0
MT090184	119.2	12.8	51.8	92.0	191.3	36.6	16.7
MT090169	119.0	12.9	50.7	89.3	187.3	36.0	31.0
MT090188	118.7	12.7	52.5	94.4	191.7	38.3	29.3
Amsterdam	118.5	14.0	53.4	93.0	190.0	36.5	0.0
MT090178	117.2	13.4	52.5	91.9	190.3	35.8	22.7
MT090180	116.1	13.2	50.5	85.2	191.0	38.6	38.3
MT070159	116.0	13.6	50.2	97.3	186.0	30.1	6.7
MT080081	115.0	14.5	53.3	96.4	192.7	33.7	0.0
MT090227	114.8	12.4	53.3	97.0	188.7	39.4	13.0
EM090128	114.5	15.7	51.6	83.3	192.7	31.1	26.7
MT070158	114.5	13.7	53.0	95.7	187.0	32.0	16.7
MT080083	113.5	14.8	52.9	96.1	192.7	34.1	5.7
MT030042	113.2	14.2	50.9	74.3	189.0	32.5	38.3
MT090202	113.0	12.7	52.7	93.7	188.7	39.0	12.0
MT070175	112.8	12.3	52.8	95.1	189.0	35.6	22.7
Scarlett	112.0	14.7	50.2	86.4	192.0	33.1	30.0
MT090176	111.2	12.8	50.7	88.2	192.0	37.9	40.0
MT090181	111.0	13.3	52.1	94.9	191.0	36.9	38.3
Copeland	110.9	13.6	51.3	85.8	194.3	38.8	21.7
EM090105	110.6	15.4	49.9	87.8	189.7	34.5	53.7
MT080085	110.2	15.4	51.2	85.1	193.0	37.8	46.0
MT061035	109.7	13.6	50.4	92.9	192.7	29.1	31.0
MT090192	109.7	13.1	52.5	89.9	191.0	37.9	36.7
Hockett	108.6	14.4	53.6	95.6	186.3	34.6	36.7
MT061104	108.2	14.4	51.6	93.8	187.7	37.8	25.3
MT010160	108.0	14.9	51.8	92.1	189.7	36.2	21.0
MT080261	107.7	13.9	51.1	92.4	186.7	33.3	4.3
Geraldine	107.7	15.2	51.0	85.8	191.7	36.1	54.3

Table 1. (continued)

Cultivar	Yield (bu/A)	Protein (%)	Test wt. (lb/bu)	Plump (%)	Heading (Julian)	Height (inches)	Lodging (%)
MT080281	107.2	13.6	51.8	93.5	187.0	31.0	19.3
EM090117	107.1	15.2	49.5	86.0	197.0	34.8	17.7
MT061169	106.9	15.1	52.8	96.0	191.7	34.4	46.0
Metcalfe	106.7	15.2	50.0	85.2	192.3	37.4	42.0
Harrington	106.6	15.5	50.6	85.1	191.3	36.1	45.0
MT070136	105.9	15.1	51.2	89.9	192.3	37.1	41.0
MT080243	105.7	15.1	50.3	81.3	191.3	35.6	53.3
MT070148	105.2	15.0	51.2	92.7	186.7	37.1	50.0
MT090183	104.3	13.1	51.8	93.9	190.7	37.7	30.0
Pinnacle	104.2	12.4	51.8	96.0	188.0	39.9	27.3
Baronesse	102.9	14.8	51.8	92.3	192.3	34.8	22.7
MT070161	102.8	13.2	53.9	95.8	187.3	29.7	0.0
Haxby	102.6	15.3	51.6	88.9	189.0	36.1	19.3
MT070174	102.3	12.6	51.8	95.4	187.3	33.7	17.0
MT090191	102.0	12.6	51.7	93.9	191.0	34.6	50.0
MT090194	100.0	13.1	50.9	91.8	191.3	37.5	46.7
MT061134	99.7	14.8	51.4	94.6	189.3	37.4	58.3
MT061201	97.3	14.1	50.1	84.3	188.7	36.9	39.3
MT020155	96.4	14.2	52.0	93.1	185.0	35.6	60.0
Craft	96.3	15.7	53.0	83.4	187.0	38.7	51.7
MT070086	95.7	13.3	52.7	97.7	190.0	26.8	4.0
Tradition	94.1	15.5	49.2	81.9	189.0	35.6	33.3
EM090081	90.4	16.0	53.0	93.2	194.0	36.7	61.0
Karma	55.5	16.7	54.3	91.0	190.0	32.2	37.7
MIN	55.5	12.3	49.2	74.3	185.0	26.8	0.0
MAX	122.2	16.7	54.3	97.7	197.0	39.9	61.0
MEAN	109.9	14.1	51.8	91.1	190.0	35.6	30.5
LSD (0.05)	20.2	NA	NA	NA	1.7	3.8	31.6
CV	11.4	NA	NA	NA	0.6	6.5	64.1
TRT (pr>f)	0.0001	NA	NA	NA	0.0001	0.0001	0.0002

Project Title:	Off-Station Barley Evaluation -2011
Principal Investigator:	Bob Stougaard
Project personnel:	Tom Blake, Stan Bates
Objectives:	To evaluate barley varieties for agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

Treatments were seeded 1.5 inches deep on April 23, 2011. Individual plots consisted of seven, 6-in wide rows, 15 feet in length with each variety replicated 3 times in a randomized complete block design. A preplant application of 150-30-120-24 lb/A of N-P-K-S was applied on April 12, 2011. Wolverine was applied at 1.7 pt/A on May 25, 2010 for weed control. Height measurements were recorded near maturity. The study was harvested August 16. Grain yield, test weight, grain moisture, and percent plump were then determined.

Plant heights averaged 30.9 inches. Tradition was the tallest (35.4 inches) and Geraldine was the shortest (28.6 inches). Lodging was not detected. Yields averaged 82 bu/A, and ranged from a high of 97 bu/A for Goldeneye to a low of 67.8 bu/A for Metcalfe. Test weights were good and averaged 50.9 lb/Bu. Test weights ranged from a low of 49 lb/bu for Goldeneye to a high of 52.8 lb/bu for Haxby. Percent plump values were low and averaged 80 percent.

Summary:

Goldeneye continues to be one of the highest yielding entries, but test weights are low.

Funding Summary: Budget information to be provided by OSP. No other grant support for this project.

MWBC FY 2012 Grant Submission Plans: Resubmittal is planned.

Table 1. Agronomic data from the barley off station nursery,Kalispell, MT 2011.

Cultivar	Yield (bu/A)	Test wt. (lb/bu)	Plump (%)	Moisture (%)	Height (inches)
Goldeneye	97.0	49.0	72.0	11.9	33.6
MT020162	90.3	50.5	83.1	12.2	30.7
Hockett	90.1	51.4	77.5	12.1	31.6
Tradition	87.8	51.4	78.5	11.1	35.4
Conrad	86.3	50.3	85.9	13.1	28.7
Pinnacle	86.0	51.1	92.2	14.5	28.7
MT020155	82.9	50.1	84.4	12.3	32.0
MT061035	81.2	49.6	69.3	11.7	29.0
Gallatin	80.7	51.6	78.1	12.6	31.4
Haxby	80.6	52.8	84.9	12.6	29.3
MT070175	79.4	51.6	84.0	13.1	32.5
MT010160	78.1	51.9	81.8	12.2	29.4
Harrington	76.8	49.5	81.9	11.8	31.8
MT010158	74.0	51.7	87.6	12.9	29.9
Geraldine	73.2	51.8	65.9	12.1	28.6
Metcalfe	67.8	50.1	77.6	12.0	31.6
MEAN	82.0	50.9	80.3	12.4	30.9
LSD (0.05)	14.7	1.6	8.5	0.8	2.8
CV	10.74	1.83	6.32	3.93	5.38

Planted April 23, harvested August 16, 2011.

Project Title: Cooperative spring wheat nursery -2011

Principal Investigator: Bob Stougaard

Objectives: To evaluate private spring wheat varieties

Results:

Treatments were seeded 1.5 inches deep on April 23, 2011. Individual plots consisted of seven, 6-in wide rows, 15 feet in length with each variety replicated 3 times in a randomized complete block design. A preplant application of 150-30-120-24 was applied on April 12. Wolverine was applied at 1.7 pt/A on May 25 for weed control. Stripe rust and height measurements were recorded on July 20. The study was harvested August 26. Grain yield, test weight, moisture, protein, and falling numbers (FN) were then determined.

Plant heights averaged 28.9 inches. Hollis was the tallest variety (35 inches) and Cabernet was the shortest (24.8 inches). Lodging was not detected. Stripe rust was evident throughout the nursery with an average infection rate at 34 percent. Rockland demonstrated the greatest resistance at 3% while Faller was the most susceptible variety with a rating of 59 percent. Stripe rust infection had a negative effect on yield and protein. Yields averaged 60 Bu/A, and ranged from a high of 73 Bu/A for Malbec to a low of 44 Bu/A for Faller. Protein content averaged 14 percent. Rockland had the highest protein (15.6) while Jerome and Knudson had the lowest protein (13.1). Test weights were also negatively affected by stripe rust. Test weights averaged 60.1 lb/Bu, and range from 57.1 lb/Bu for Faller to 62.5 lb/Bu for Kelby. Falling numbers tended to decrease as stripe rust infection declined. Falling numbers average 365 and ranged from a high of 435 for McNeal to a low of 312 for Rockland.

Summary

Grain yield and quality was strongly affected by stripe rust resistance. Rockland had the greatest level of resistance, the highest protein content and the lowest falling numbers value. Faller had the lowest yield, the greatest level of stripe rust infection and the lowest test weight.

Funding Summary: Budget information to be provided by OSP. No other grant support for this project.

MWBC FY 2012 Grant Submission Plans: Resubmittal is planned.

Table 1. Agronomic data from the cooperative spring wheat evaluation, Kalispell, MT 2011.

Cultivar	Yield (bu/A)	Stripe rust (%)	Test wt. (lb/bu)	Protein (%)	Height (inches)	Moisture (%)	FN (sec.)
Malbec	73	14	60.0	14.0	27.0	10.4	355
Solano	67	17	59.8	14.2	25.2	10.3	358
Vida	66	42	59.2	13.7	30.7	10.6	361
Expresso	65	8	59.7	14.8	27.3	10.2	348
Traverse	65	45	59.0	13.6	33.5	10.4	374
Choteau	65	30	60.5	14.4	29.5	10.9	383
Reeder	64	38	61.0	14.0	31.5	10.4	332
Rockland	63	3	60.6	15.6	24.9	10.2	312
RB07	62	28	61.8	14.3	28.9	10.7	360
Cabernet	61	28	60.5	13.9	24.8	10.5	370
Bullseye	60	43	60.2	13.7	26.8	10.6	419
Knudson	59	50	60.9	13.1	30.7	10.7	379
Hollis	57	40	60.1	13.9	35.0	10.7	348
Jerome	56	53	58.1	13.1	27.6	10.7	365
Kelby	55	26	62.5	15.1	28.6	10.4	355
Kuntz	50	43	60.6	13.5	28.0	10.7	415
McNeal	49	47	59.7	13.4	30.8	10.0	435
Faller	44	59	57.1	13.4	29.4	10.5	355
MEAN	60	34	60.1	14.0	28.9	10.5	365
LSD (P=.05)	6.74	15.27	0.636	0.365	2.401451	0.229	60.24
CV	6.73	26.73	0.64	1.57	4.98	1.31	9.82

Planted April 23, harvested August 29, 2011.

Project title: Effects of seed color on spring wheat resistance to the orange wheat blossom midge (owbm) – 2011.

Principal Investigator: Bob Stougaard

Objectives: Determine if spring wheat resistance to the owbm varies by market class.

Results:

The S*m1* gene is responsible for the production of two phenolic compounds, coumaric acid and ferulic acid. Phenolics are widely distributed throughout the plant and perform a number of important functions. Among other things, phenolics are key constituents, and are associated with seed color. Experiments were established to evaluate the above mentioned trait for resistance to the orange wheat blossom midge.

Ten hard red and ten soft white spring wheat varieties were evaluated for resistance to the owbm as well as for agronomic performance. Midge densities varied depending on variety, ranging from a low of 1.0/spike for Treasure, to a high of 341/spike for Solano (Table 1). Market class did influence infestation levels in 2011, with the soft whites having slightly lower densities. Larval densities were higher than normal and averaged 144/spike among the soft white varieties and 192/spike with the hard reds. However, the numerical advantage associated with the soft whites was largely attributed to the low densities found with the variety Treasure.

Midge densities had a negative effect on yield. The soft white varieties had slightly higher yields compared to the hard reds, averaging 34 bu/A and 22 bu/A, respectively. As of last year, Treasure and Eden were the highest and lowest yielding soft white wheats. However, yield rankings for the hard reds changed in 2012, with Volt and Choteau having the highest and lowest yields for the hard red class.

Not surprisingly, grain quality was negatively affected by the midge damage. Test weights were low and averaged 55 lb/bu and 53 lb/bu for the soft white and hard red classes, respectively. Protein also varied between market classes since yield is inversely related to protein. The soft white and hard red varieties averaged 14.68 and 17.41 percent protein, respectively. Protein levels for the hard reds varied from a high of 18.7 for Solano to a low of 15 for Faller. In contrast, soft whites varied from a high of 16 for Alpowa to a low of 12.17 for Treasure.

Falling numbers was another quality trait of interest. There were no differences in falling numbers among the two market classes, with the soft whites averaging 274 and the hard reds averaging 268. Falling numbers for the hard reds varied from a high of 323 for Amidon to a low of 177 for Solano, while the soft whites varied from a high of 357 for Jubilee to a low of 172 for Louise. Although no difference in falling numbers could be detected, there was a trend for falling numbers to decrease as midge densities increased.

Overall, the results demonstrate that while midge densities vary among varieties, there are no differences in oviposition preference between hard red and soft white varieties.

Table 1. Effect of wheat market class on OWBM densities. Kalispell, MT 2011.

	Yield	OWBM	Test wt.	Protein	FN	Heading	Height
Variety	BU	avg	lb/bu	%	sec	julian	inches
				soft white			
Alpowa	23.9	146.3	56.1	16.00	266	205.0	40
Alturas	29.8	147.7	55.6	15.13	283	200.7	38
Calorwa	44.0	150.0	54.9	14.47	306	198.7	35
Cataldo	27.9	145.3	55.0	14.80	274	195.7	36
Eden	11.8	272.0	53.2	15.67	235	199.7	37
Jubilee	40.2	139.7	56.4	13.37	357	202.0	40
Louise	32.0	203.3	53.5	15.83	172	199.3	41
Nick	37.2	83.3	55.1	14.63	267	197.3	35
Pettit	14.6	147.7	51.9	14.77	250	196.0	34
Treasure	78.9	1.0	57.9	12.17	327	202.7	38
mean	34.0	143.6	55.0	14.68	274	199.7	37
				hard red			
Amidon	16.4	183.0	54.4	18.27	323	198.3	44
Choteau	7.8	214.0	51.9	18.40	245	197.0	36
Faller	43.7	108.3	53.3	15.03	367	198.3	39
Fortuna	10.0	159.7	53.2	17.70	295	199.3	44
Hank	9.3	321.3	48.9	17.47	199	196.3	35
McNeal	15.9	269.0	51.3	17.93	303	198.7	39
Reeder	37.8	81.7	58.4	17.30	272	197.0	40
Solano	12.7	341.0	50.6	18.70	177	199.0	30
Vida	10.3	145.7	53.1	18.17	188	198.0	39
Volt	55.6	96.7	57.9	15.17	306	202.3	37
mean	21.9	192.0	53.3	17.41	268	198.4	38
				white vs red			
LSD (P=.05)	9.23	46.15	1.30	0.63	NS	1.25	NS
CV	63.84	53.17	4.61	7.69	23.82	1.22	9.48
MC Pr>F	0.0114	0.0402	0.0159	0.0001	0.7125	0.0484	0.3072
				among varieties			
LSD (P=.05)	5	77.1	1.303	0.49	62.09	1.07	2.83
CV	10.84	27.84	1.46	1.83	13.9	0.33	4.52
TRT Pr>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Project Title: Effects of Plant Growth Regulators (PGR's) and Growth Stage (GS) on Spring Wheat Yield and Quality, 2011.

Principal Investigator: Bob Stougaard

Objective: To evaluate the effect of plant growth stage on spring wheat response to plant growth regulators.

Materials and Methods:

This study was conducted to compare the efficacy of the PGR's Cerone and Palisade when applied alone or in combination at five growth stages. The study area had been planted to spring wheat the previous six years and had a history of moderate orange wheat blossom midge densities. The soil type was a Creston silt loam, with a pH of 7.5 and an organic matter content of 4.5 percent. The site was fertilized with a blend of N-P-K-S at rates of 150-30-120-24 lb/A, respectively. Hank spring wheat was seeded on May 19 at a rate of 85 lb/A in 8-inch wide rows.

The treatments were applied at jointing, flag leaf, boot, heading, and watery ripe GS's, on July 2, 7, 11, 14, and 29, respectively. Crop height at application measured 17, 20, 23, 24, and 34 inches, respectively. Treatments were applied to plot areas measuring 10 by 15 feet at 20 GPA with a backpack sprayer. Tilt was applied at 4 oz/A on June 24 to control stripe rust. The study was harvested on September 21.

Results:

Both PGR's reduced plant height, but height reductions were greatest with the combination of the two products. Growth stage impacted efficacy, with the greatest height reductions being observed with applications made at the boot and heading stages. Yields were low, averaging only 19 bu/A. This occurred as a result of a severe orange wheat blossom midge infestation. Yields were not affected by PGR, but GS did impact yields. The lowest yields were observed when treatments were applied at the watery ripe stage. At the same time, protein content was highest when treatments were applied at the watery ripe stage. Growth stage also impacted test weight, thousand kernel weight and falling numbers. Applications made at boot and heading had the greatest test weights and thousand kernel weights, but the lowest falling numbers. When comparing products, Palisade resulted in higher protein and test weight, but lower falling numbers relative to Cerone.

Summary:

Cerone and Palisade reduced plant height with the greatest impact being observed when treatments were applied at boot and heading. These timings also corresponded to the highest test weights and thousand kernel weights, and the lowest falling numbers.

Table 1. Plant growth regulator effects on spring wheat yield and quality, 2011.

Growth stage	Height inches	Yield bu/A	Protein %	TWT lb/bu	TKW g	OWBM no./spk	PPO	FN sec	moist %
Palisade									
Check	33	19	16.57	52	32	232	0.220	188	17
Jointing	32	18	16.73	53	30	247	0.180	149	17
Flag leaf	34	20	16.87	53	32	264	0.230	145	17
Boot	31	19	16.90	54	35	240	0.240	110	17
Heading	31	20	16.93	54	35	206	0.220	112	17
Watery ripe	34	17	17.43	53	33	196	0.230	144	16
Cerone									
Check	34	24	16.57	52	33	205	0.220	240	16
Jointing	33	16	16.63	51	28	222	0.250	253	16
Flag leaf	33	19	16.43	52	30	227	0.200	204	16
Boot	33	21	16.60	52	32	174	0.230	202	17
Heading	32	21	16.37	53	33	287	0.250	214	17
Watery ripe	35	17	16.77	53	31	219	0.190	181	17
Palisade + Cerone									
Check	36	19	16.67	52	31	177	0.180	216	17
Jointing	30	19	16.77	53	30	119	0.180	239	17
Flag leaf	28	21	16.53	54	33	233	0.200	168	16
Boot	27	23	16.40	54	33	208	0.250	152	17
Heading	28	27	16.67	55	34	186	0.270	123	18
Watery ripe	35	16	17.07	53	32	208	0.170	217	15
Mean	32.12	19.76	16.72	52.98	31.97	214.04	0.22	180.87	16.75
CV	4.52	21.61	1.62	2.25	9.45	24.25	25.34	26.04	8.68
LSD	2.422	7.12	0.451	2.00	5.035	86.555	0.092	78.516	2.424
TRT Pr>F	0.0001	0.2142	0.0055	0.0408	0.3862	0.1328	0.5469	0.006	0.8417
PGR LSD	*1.03*	*NS*	*0.18*	*0.79*	*NS*	*35.16*	*NS*	*31.90*	*NS*
Palisade	32.5	18.7	16.90	53.2	32.7	231.0	0.218	141.3	17.0
Cerone	33.2	19.8	16.56	52.2	31.2	222.0	0.223	215.6	16.5
Palisade + Cerone	30.5	20.8	16.68	53.4	32.1	189.0	0.208	185.7	16.7
Growth stage LSD	*1.46*	*4.09*	*0.26*	*1.12*	*2.89*	*NS*	*NS*	*45.11*	*NS*
Check	34.3	20.6	16.6	52.2	32.0	204.5	0.205	241.5	16.6
Jointing	31.2	17.8	16.7	52.2	29.5	196.3	0.199	213.3	16.6
Flag leaf	31.5	20.1	16.6	52.8	31.6	241.3	0.208	172.5	16.5
Boot	30.6	20.8	16.6	53.4	33.6	207.4	0.241	154.5	17.1
Heading	30.2	22.6	16.6	54.0	33.6	226.5	0.248	149.7	17.3
Watery ripe	34.5	16.5	17.1	53.1	31.7	208.0	0.196	180.4	16.1

Project Title: Effect of fungicide rate and time of application on stripe rust control in spring wheat – 2011.

Principal Investigator: Bob Stougaard

Objective: To evaluate the effect of Stratego rate and application timing for stripe rust control in spring wheat.

Materials and Methods:

The spring wheat variety "Hank" was seeded on May 19, 2011 at a rate of 80 lb/A to a depth of 1.5 inches on 8 inch row-spacings. The soil type was a Creston silt loam with 4.5% organic matter and a pH of 7.5. The field was fertilized with N-P-K-S at a rate of 150-30-120-24 lb/A. The factorial treatment design consisted of Stratego applied at six rates and three application timings. Stratego rates included 0.125, 0.25., 0.50, 0.75, and 1.0X of the labeled rate (10 oz/A) as well as a non-treated control. Application timings consisted of tillering, flag leaf, and tilling plus flag leaf. The tillering treatments were applied on June 28 and the flag leaf treatments were applied on July 7 when the crop was 12 and 20 inches in height, respectively. At the same time, stripe rust infection levels were 13 and 35 percent. Stratego was applied with a backpack sprayer in 20 GPA of water to individual plots which measured 10 by 15 feet. The experimental design was a randomized complete block with three replications. The treatments were assessed for percent stripe rust infection on July 29, and the study was harvested on September 14, 2011.

Results:

Stripe rust infection levels ranged from a high of 68% in the non-treated control to a low of 6% when the 1X rate was applied at tillering plus flag leaf growth stages. Stripe rust control improved as rates increased. However, control did not increase much at rates above 0.50X. Indeed, application timing was more important than use rate in terms of the level of control. The poorest control was obtained when Stratego was applied at tillering. There was no difference in control between applications made at flag leaf compared to the sequential applications made at tiller plus flag leaf. These results demonstrate that applications made at flag leaf were most critical in terms of controlling stripe rust. More to the point, applications made at the tillering stage were ineffective.

The tillering applications were ineffective due to rapid plant growth and the corresponding dilution effect on fungicide concentration. Crop heights increased from 12 to 20 inches within the nine day period that separated the tillering and flag leaf application stages, respectively. The newly formed, non-treated tissue was vulnerable to infection and the corresponding negative effects on plant growth and development. The effect of application timing also was evident for grain yield, protein, test weight, and thousand kernel weight. Stratego rate and timing and no effect on falling numbers.

Table 1. Effect of Stratego rate and timing on stripe rust control in spring wheat, 2011.

Application Timing	Rate oz/A	SR %	Yield bu/A	Protein %	TWT lb/bu	TKW g	FN sec
Control	0.00	68	36	15.63	52	30	325
Tiller	1.25	57	30	16.40	49	26	350
Flag	1.25	40	49	15.13	55	32	320
Tiller plus flag	1.25	27	44	15.80	52	29	331
Tiller	2.50	43	39	16.10	50	26	325
Flag	2.50	28	52	14.77	55	35	313
Tiller plus flag	2.50	7	60	15.60	54	32	295
Tiller	5.00	38	44	16.00	51	28	332
Flag	5.00	16	54	14.77	56	36	320
Tiller plus flag	5.00	9	56	15.60	54	34	331
Tiller	7.50	47	37	16.37	50	27	344
Flag	7.50	10	55	15.30	55	34	328
Tiller plus flag	7.50	7	64	15.67	56	36	311
Tiller	10.00	41	45	16.13	51	27	307
Flag	10.00	8	61	14.93	57	37	309
Tiller plus flag	10.00	6	65	15.37	56	36	296
	Mean	28.31	49.41	15.6	53.38	31.64	321.02
	CV	28.69	21.26	2.47	3.49	11.06	10.8
	LSD (P=.05)	13.544	17.52	0.642	3.1	5.836	57.823
	Pr>F	0.0001	0.0043	0.0001	0.0001	0.0006	0.8566

SR: stripe rust, TWT: test weight, TKW: thousand kernel weight, FN: falling number

Project Title:	Evaluation of Advanced Spring Wheat Experimental Lines - 2011
Principal Investigator:	Bob Stougaard
Cooperators:	Luther Talbert and Susan Lanning, PSPP, Bozeman
Objectives:	To evaluate spring wheat varieties and experimental lines for agronomic performance, as well as disease and insect resistance in environments and cropping systems representative of northwestern Montana.

Materials and Methods:

The previous crop was alfalfa and the field was fertilized with 150-30-120-24 lb/A of N-P-K-S, respectively, on April 27. The soil type was a Creston silt loam (25-50-25) with an organic matter content of 4% and a pH of 7.5. Treatments were seeded 1.5 inches deep on May 5. Individual plots consisted of seven, 6-in wide rows, 15 feet in length with each variety replicated 3 times in a randomized complete block design. Wolverine was applied at 1.7 pt/A on May 25 for weed control. Stripe rust (SR) and height measurements were recorded on July 20. Orange wheat blossom midge (OWBM) populations were assessed on August 4 by randomly harvesting three spikes from each plot in the first replication. The spikes were dissected and the midge larvae numbers were determined. The study was harvested September 23. Grain yield, test weight, moisture, protein, and falling numbers (FN) were then determined.

Results:

Plant heights averaged 31 inches. Fortuna was the tallest variety (39 inches) and Jedd was the shortest (23 inches). Lodging was not detected. Stripe rust was evident throughout the nursery with an average infection rate at 33 percent. Rockland demonstrated the greatest resistance at 1.6% while AP604 CL was the most susceptible variety with a rating of 98.6 percent. Stripe rust infection had a negative effect on yield and protein. However, OWBM populations were extreme, and the associated feeding damage also negatively impacted yields. OWBM populations varied from a low of 4.7/spike for Brennan to a high of 302/spike for MT 0802! The combined effect of these two “orange pests” on grain yield and quality depended on the level of resistance/tolerance expressed by the individual varieties. Yields averaged 26 Bu/A, and ranged from a high of 60 Bu/A for MT 1073 to a low of 4 Bu/A for Thatcher. Protein content averaged 17 percent. Vantage had the highest protein (20.20) while AP604 CL had the lowest protein (14.80). Test weights were also negatively affected by stripe rust and OWBM damage. Test weights averaged 51.8 lb/Bu, and range from 44.2 lb/Bu for Hank to 58.40 lb/Bu for Brennan. Falling numbers averaged 232 and ranged from a high of 458 for AGRIPRO SY605 CL to a low of 62 for MT 0802.

Summary

Grain yield and quality was strongly affected by stripe rust resistance and OWBM tolerance. Buckpronto, Volt and Reeder were the top yielding commercial varieties, followed closely by Rockland and Brennan.

Table 1. Agronomic and OWBM data from the advanced yield spring wheat nursery. Kalispell 2011.

Cultivar	Heading (Julian)	Height (inches)	Yield (bu/A)	SR (%)	Protein (%)	Test wt. (lb/bu)	OWBM No/spike	FN (sec)
MT 1073	190.00	32.68	60.76	2.33	16.60	57.30	30.70	145
BUCKPRONTO	187.00	33.99	52.56	14.67	17.00	57.30	29.30	341
MT 1072	190.33	30.45	50.36	18.67	16.60	54.40	39.30	122
MTHW1064	190.33	34.12	47.51	26.67	16.40	54.70	56.00	155
10FX INC	189.00	30.18	46.98	25.33	15.20	55.30	38.00	283
MTHW1065	189.33	32.41	46.45	17.33	15.90	55.80	123.30	180
VOLT	194.00	30.71	45.69	3.00	16.50	54.20	85.30	169
REEDER	190.67	33.33	44.19	17.67	16.90	56.10	10.00	210
MTHW1069	190.67	29.92	38.48	9.00	16.70	54.90	98.70	277
WB ROCKLAND	190.33	25.85	38.23	1.67	18.00	53.70	40.00	170
BRENNAN	190.33	28.22	37.63	38.00	15.20	58.40	4.70	243
CHOTWHT1	189.33	32.02	36.97	28.33	16.00	51.90	47.30	274
MT 1049	190.67	30.97	36.54	18.33	16.80	58.00	46.70	239
MT 0967	189.33	31.10	34.69	37.33	16.50	55.80	54.00	138
AGRIPRO SY605 CI	189.00	33.20	34.51	48.33	17.10	57.00	21.30	458
KELBY	189.67	31.36	33.88	43.33	15.90	57.80	70.70	220
MT 0802	192.33	35.83	33.35	13.33	18.10	51.30	302.00	62
SY SOREN	190.67	27.82	32.66	40.00	16.30	54.70	18.70	324
MT 0928	191.00	34.51	31.45	20.67	17.80	51.20	58.70	335
AP604 CL	189.33	31.50	31.09	98.67	14.80	54.00	10.00	371
DUCLAIR	189.33	33.07	30.83	11.33	16.60	52.20	74.00	273
SY TYRA	192.00	28.74	29.96	71.00	15.70	50.10	23.30	205
MT 1013	190.67	31.76	29.64	35.67	17.90	49.20	32.00	201
MT 1020	191.33	30.84	29.20	22.67	16.90	49.60	40.70	285
MTHW1060	188.33	28.61	28.94	55.33	15.70	52.10	60.70	178
HANKWHT1	189.67	27.82	28.17	64.33	15.90	46.80	75.30	147
MT 1015	191.67	32.15	27.97	26.67	18.20	53.60	69.30	317
KUNTZ	191.67	29.66	26.83	21.33	16.90	55.90	114.00	315
FORTUNA	192.00	38.85	25.08	21.67	17.70	55.40	264.00	232
MCNEAL	191.67	32.68	24.01	26.33	17.20	50.80	82.00	342
WB GUNNISON	191.00	30.58	23.76	22.00	16.80	54.20	73.30	139
VIDAWHT1	191.33	30.84	23.49	27.33	17.60	53.50	44.00	96
MT 1003	190.67	31.36	22.33	32.67	17.10	48.10	29.30	.
BREAKER	191.67	32.15	22.05	14.33	17.60	55.30	70.00	264
CHOTEAU	191.00	31.76	21.41	8.33	17.20	50.00	64.00	288
MT 1007	191.00	30.84	20.92	47.67	17.00	48.80	23.30	343
MT 1036	192.00	32.02	20.37	31.00	17.70	48.70	136.70	.
MT 1028	191.67	32.68	19.80	20.67	17.80	49.50	158.00	244
MT 1030	191.67	32.94	19.38	17.33	17.90	49.10	217.30	.
VANTAGE	196.00	32.94	19.36	22.00	20.20	54.80	103.30	191

Table 1. Continued

Cultivar	Heading (Julian)	Height (inches)	Yield (bu/A)	SR (%)	Protein (%)	Test wt. (lb/bu)	OWBM No/spike	FN (sec)
CORBIN	190.33	30.32	19.26	37.00	16.70	52.10	84.70	249
MT 1005	190.33	30.32	19.18	56.67	16.80	48.10	33.30	375
IMICHT79	191.33	30.71	19.13	37.33	18.20	48.20	93.30	.
MT 1027	191.67	30.71	19.10	15.67	17.50	49.70	86.00	.
HANK	190.33	29.00	18.90	67.67	16.90	44.20	58.70	196
VIDA	191.33	33.07	18.88	25.33	17.80	52.80	113.30	138
MT 1004	191.33	30.84	18.22	24.00	17.20	48.20	106.00	.
AGRIPR11	192.67	28.35	17.99	52.67	18.20	49.20	102.00	287
MT 1038	192.00	32.68	17.95	24.00	17.80	49.30	45.30	.
MT 1011	191.33	29.13	17.87	60.33	17.50	48.70	59.30	283
MT 1053	191.67	29.40	17.12	46.00	17.30	51.30	207.30	155
MT 1016	191.33	32.02	17.09	18.00	18.20	49.20	122.00	.
ONEAL	192.33	29.66	16.89	52.33	17.80	50.30	100.00	299
MT 1008	193.00	32.55	15.33	34.67	17.90	49.50	72.00	214
MT 1002	192.33	32.41	15.11	30.00	17.20	49.60	80.70	339
MOTT	194.33	32.02	14.64	88.33	18.40	52.40	59.30	205
MTHW1057	192.33	30.05	14.17	12.67	17.30	51.20	266.00	77
MT 0972	190.67	31.10	13.98	29.00	18.60	51.80	109.30	80
MT 1035	192.00	30.97	13.83	18.33	18.20	49.00	52.00	.
CONAN	191.00	28.74	13.35	47.00	16.60	50.00	46.00	218
MT 1010	192.00	32.15	10.89	48.33	17.10	50.30	36.70	280
MT 0852	192.00	30.97	10.19	43.00	17.10	47.80	46.70	140
JEDD	190.00	23.36	6.28	88.00	17.00	44.30	28.00	.
THATCHER	196.33	37.01	4.73	69.00	18.00	48.70	223.30	.
MIN	187.00	23.36	4.73	1.67	14.80	44.20	4.70	62
MAX	196.33	38.85	60.76	98.67	20.20	58.40	302.00	458
MEAN	191.15	31.25	26.21	33.56	17.14	51.83	80.79	232
LSD (0.05)	1.11	2.98	7.88	12.53	NA	NA	NA	NA
CV	0.36	5.90	18.48	23.10	NA	NA	NA	NA
TRT (pr>f)	0.0001	0.0001	0.0001	0.0001	NA	NA	NA	NA

Project Title: Evaluation of spring wheat varieties for resistance to the Orange Wheat Blossom Midge (OWBM) – 2011.

Principal investigator: Bob Stougaard

Project personnel: Luther Talbert and Susan Lanning

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

Results

Germplasm from the Advanced Yield Trial was evaluated for susceptibility to the OWBM in order to determine if alternative resistance mechanisms exist. The previous crop was alfalfa and the field was fertilized with 150-30-120-24 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%, and a pH of 7.5. Treatments were seeded 1.5 inches deep on May 5, 2011. Individual plots consisted of seven, 6-in wide rows, 15 feet in length with each variety replicated 3 times in a randomized complete block design. Wolverine was applied at 1.7 pt/A on May 25, 2011 for weed control. Heading was recorded when 50 percent of the plants in a plot had half the head exposed. Three wheat heads were collected from each plot in the first replication to determine midge larval numbers. Height measurements were recorded near maturity. The study was harvested September 23, 2011. Grain yield, test weight, protein and grain moisture were then determined.

Midge densities were extremely high, averaging 80 larvae per spike. In comparison, the previous year midge densities averaged 10 larvae per spike. Midge densities ranged from a low of 5 for Brennan to a high of 302 for MT0802. In addition to Brennan, low midge densities (less than 20 per spike) were also found in Reeder, AP604 CL, and SY Soren. The most susceptible cultivars (more than 200 per spike) included MT 0802, as well as MT 1053, MT1030, Thatcher, Fortuna, and MTHW1057.

While midge densities were high, stripe rust also was present. Stripe rust infection averaged 33 percent and ranged from a low of 2% for Rockland and MT 1073 to a high of 99% for AP604 CL. The impact of these two pests resulted in low yields and poor grain quality. Towards that end, yields averaged 26 bu/A, and test weights averaged 52 lb/bu. Yields ranged from 60 bu/A for MT 1072 to a low of 5 bu/A for Thatcher, while test weights ranged from a high of 58 lb/bu for Brennan to a low of 44 lb/bu for Hank.

Overall, the high insect pressure was beneficial in identifying which varieties are least attractive to the orange wheat blossom midge.

Table 1. Agronomic and OWBM data from the advanced yield spring wheat nursery. Kalispell 2011.

Cultivar	Yield (bu/A)	Stripe rust (%)	Protein (%)	Test wt. (lb/bu)	OWBM No/spike
MT 1073	60.76	2.33	16.60	57.30	30.70
BUCKPRONTO	52.56	14.67	17.00	57.30	29.30
MT 1072	50.36	18.67	16.60	54.40	39.30
MTHW1064	47.51	26.67	16.40	54.70	56.00
10FX INC	46.98	25.33	15.20	55.30	38.00
MTHW1065	46.45	17.33	15.90	55.80	123.30
VOLT	45.69	3.00	16.50	54.20	85.30
REEDER	44.19	17.67	16.90	56.10	10.00
MTHW1069	38.48	9.00	16.70	54.90	98.70
WB ROCKLAND	38.23	1.67	18.00	53.70	40.00
BRENNAN	37.63	38.00	15.20	58.40	4.70
CHOTWHT1	36.97	28.33	16.00	51.90	47.30
MT 1049	36.54	18.33	16.80	58.00	46.70
MT 0967	34.69	37.33	16.50	55.80	54.00
AGRIPRO SY605 CL	34.51	48.33	17.10	57.00	21.30
KELBY	33.88	43.33	15.90	57.80	70.70
MT 0802	33.35	13.33	18.10	51.30	302.00
SY SOREN	32.66	40.00	16.30	54.70	18.70
MT 0928	31.45	20.67	17.80	51.20	58.70
AP604 CL	31.09	98.67	14.80	54.00	10.00
DUCLAIR	30.83	11.33	16.60	52.20	74.00
SY TYRA	29.96	71.00	15.70	50.10	23.30
MT 1013	29.64	35.67	17.90	49.20	32.00
MT 1020	29.20	22.67	16.90	49.60	40.70
MTHW1060	28.94	55.33	15.70	52.10	60.70
HANKWHT1	28.17	64.33	15.90	46.80	75.30
MT 1015	27.97	26.67	18.20	53.60	69.30
KUNTZ	26.83	21.33	16.90	55.90	114.00
FORTUNA	25.08	21.67	17.70	55.40	264.00
MCNEAL	24.01	26.33	17.20	50.80	82.00
WB GUNNISON	23.76	22.00	16.80	54.20	73.30
VIDAWHT1	23.49	27.33	17.60	53.50	44.00
MT 1003	22.33	32.67	17.10	48.10	29.30
BREAKER	22.05	14.33	17.60	55.30	70.00
CHOTEAU	21.41	8.33	17.20	50.00	64.00
MT 1007	20.92	47.67	17.00	48.80	23.30
MT 1036	20.37	31.00	17.70	48.70	136.70
MT 1028	19.80	20.67	17.80	49.50	158.00
MT 1030	19.38	17.33	17.90	49.10	217.30
VANTAGE	19.36	22.00	20.20	54.80	103.30

Table 1. Continued

Cultivar	Yield (bu/A)	Stripe rust (%)	Protein (%)	Test wt. (lb/bu)	OWBM No/spike
CORBIN	19.26	37.00	16.70	52.10	84.70
MT 1005	19.18	56.67	16.80	48.10	33.30
IMICHT79	19.13	37.33	18.20	48.20	93.30
MT 1027	19.10	15.67	17.50	49.70	86.00
HANK	18.90	67.67	16.90	44.20	58.70
VIDA	18.88	25.33	17.80	52.80	113.30
MT 1004	18.22	24.00	17.20	48.20	106.00
AGRIPR11	17.99	52.67	18.20	49.20	102.00
MT 1038	17.95	24.00	17.80	49.30	45.30
MT 1011	17.87	60.33	17.50	48.70	59.30
MT 1053	17.12	46.00	17.30	51.30	207.30
MT 1016	17.09	18.00	18.20	49.20	122.00
ONEAL	16.89	52.33	17.80	50.30	100.00
MT 1008	15.33	34.67	17.90	49.50	72.00
MT 1002	15.11	30.00	17.20	49.60	80.70
MOTT	14.64	88.33	18.40	52.40	59.30
MTHW1057	14.17	12.67	17.30	51.20	266.00
MT 0972	13.98	29.00	18.60	51.80	109.30
MT 1035	13.83	18.33	18.20	49.00	52.00
CONAN	13.35	47.00	16.60	50.00	46.00
MT 1010	10.89	48.33	17.10	50.30	36.70
MT 0852	10.19	43.00	17.10	47.80	46.70
JEDD	6.28	88.00	17.00	44.30	28.00
THATCHER	4.73	69.00	18.00	48.70	223.30
MIN	4.73	1.67	14.80	44.20	4.70
MAX	60.76	98.67	20.20	58.40	302.00
MEAN	26.21	33.56	17.14	51.83	80.79
LSD (0.05)	7.88	12.53	NA	NA	NA
CV	18.48	23.10	NA	NA	NA
TRT (pr>f)	0.0001	0.0001	NA	NA	NA

Project Title: Evaluation of the Sm1 gene for antibiotic resistance to the Orange Wheat Blossom Midge (OWBM) -2011.

Principal Investigator: Bob Stougaard and Luther Talbert

Objectives: To verify the presence of the Sm1 gene and to evaluate the agronomic performance of experimental lines of spring wheat.

Results:

Thirteen experimental lines, along with the commercial varieties Hank and Reeder, were evaluated for resistance to the OWBM at Kalispell during 2011. The study was established in a field which had been in spring wheat for the previous five years and had a history of moderate to high midge densities. The study was conducted using conventional tillage and was fertilized with 150-30-120-24 lb/A of N-P-K-S.

Treatments were seeded at a rate of 75 lb/A in six inch wide rows, to a depth of two inches on May 18, 2011. Individual treatments consisted of seven, 15 foot long rows, with each treatment replicated three times in a randomized complete block design. The nursery was treated with Tilt on June 24 for the control of stripe rust. Plant height measurements were taken the last week of July. Three spikes were sampled from each plot on August 16. Each spike was dissected and the number of larvae and seeds counted. Plots were harvested on September 16 to determine grain yield, protein, test weight, and polyphenol oxidase (PPO).

Midge populations during 2011 were well above the long term average. While the susceptible variety Hank had over 150 larvae per spike, most of the experimental lines had no midge larvae (Table 1). These results illustrate that the resistance gene is extremely durable and that the gene has successfully been crossed into Montana adapted germplasm. The lack of midge resistance in susceptible lines was correspondingly reflected in low yields. Hank and Reeder yielded 13 and 39 bu/A, respectively, while the experimental lines had an average yield of 64 bu/A. Within the experimental lines, yields ranged from a high of 84 bu/A for CAP197-3 to a low of 44 bu/A for CAP172-2. The overall average yield was 59 bu/A.

Test weights averaged 56 lb/bu. Within the experimental lines, CAP197-3 had the highest test weight (58.8) while CAP172-2 had the lowest test weight (56.3). Protein averaged greater than 15 % and ranged from 16.8% for CAP172-2 to 14.6% for CAP34-1. Falling number values were all above 320 except for CAP339-1 which produced a value of 274.

Overall, these preliminary results demonstrate that there are several high yielding experimental lines that have resistance to the midge, while also possessing excellent quality attributes.

Table 1. Evaluation of experimental spring wheat lines for resistance to the midge. Kalispell, 2011.

ID	Yield Bu/A	Test wt. lb/Bu	Heading Julian	Height inches	OWBM No/head	Protein %	PPO	Moist. %	FN sec
CAP34-1	72.5	57.9	196.3	34.4	0.0	14.6	0.223	14.4	366
CAP73-1	49.6	57.3	195.7	38.5	0.0	15.2	0.176	14.6	363
CAP84-1	62.9	56.9	195.7	37.9	0.0	14.8	0.170	14.4	389
CAP84-2	60.1	57.0	195.7	37.0	0.0	15.1	0.196	14.4	380
CAP108-3	66.3	56.5	197.0	36.6	0.0	15.0	0.171	14.1	369
CAP151-3	51.8	57.6	195.0	33.6	3.0	16.0	0.186	14.3	356
CAP172-2	44.7	56.3	195.0	35.6	0.3	16.8	0.184	14.3	377
CAP197-3	84.8	58.8	197.7	39.9	0.3	15.3	0.213	14.7	396
CAP201-2	67.2	58.0	196.0	38.2	0.7	16.4	0.206	14.1	342
CAP219-2	65.3	56.9	195.3	40.2	3.0	15.6	0.220	14.4	379
CAP219-3	65.4	56.7	196.3	38.3	0.0	14.9	0.242	14.0	347
CAP339-1	68.8	57.5	194.0	38.7	0.3	16.2	0.188	14.1	274
CAP400-1	79.6	57.7	198.3	37.0	0.3	16.4	0.207	13.3	395
REEDER	38.8	57.6	196.3	41.5	62.3	16.7	0.220	15.3	368
HANK	13.4	50.8	195.7	34.3	151.3	15.3	0.261	13.9	257
Mean	59.40	56.89	196.00	37.44	14.78	15.62	0.20	14.28	352
LSD (0.05)	9.98	0.96	0.75	2.90	2.43	1.60	NS	0.78	50.7
CV	10.64	1.02	0.23	4.60	93.00	6.09	19.61	3.27	8.67
Prob>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0314	0.2581	0.0173	0.0001

Project Title: Soft White Spring Wheat Nursery - 2011

Principal Investigator: Bob Stougaard

Project personnel: Luther Talbert, 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:

Treatments were seeded 1.5 inches deep on April 23, 2011. Individual plots consisted of seven, 6-in wide rows, 15 feet in length with each variety replicated 3 times in a randomized complete block design. A preplant application of 150-30-120-24 lb/A of N-P-K-S was applied on April 12, 2011. Wolverine was applied at 1.7 pt/A on May 25 for weed control. Height measurements were recorded near maturity. The study was harvested on August 30, 2011. Grain yield, test weight, protein and grain moisture were then determined.

Plant heights averaged 28.7 inches, with Calorwa being the shortest (25.5), while Alpowa and Choteau were the tallest varieties at 29.7 inches. Yields were low and averaged only 56 bu/A, as compared to the previous year when yields averaged 104 bu/A. The highest yield was produced from Alturas (73.5 bu/A). Test weights also were below normal and averaged 59.2 lb/bu. Protein averaged 12.4 percent. The hard red check variety, Choteau, had the highest protein (14.7%) while Alturus and BZ604-002 had the lowest protein content at 11 percent.

Summary:

Yields were below normal for this area. The relative yield rankings continue to fluctuate each year making it difficult to definitively select the best variety. However, Alturas tends to be ranked as one of the highest yielding varieties.

Funding Summary: B udget information to be provided by OSP. No other grant support for this project.

MWBC FY2012 Grant Submission Plans: Resubmittal is planned.

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

Variety	Yield	Moisture	Test wt.	Protein	Height
	(bu/A)	(%)	(lb/bu)	(%)	(inches)
Alturas	73.5	10.9	60.2	11.0	29.5
Louise	68.0	10.7	58.1	12.3	32.2
Pettit	63.7	10.8	61.1	11.7	27.3
Wakanz	61.9	10.1	58.1	13.1	29.0
Eden	61.4	10.5	61.0	11.4	29.1
Alpowa	60.1	11.1	60.5	11.4	29.7
Choteau	59.6	10.6	60.0	14.7	29.7
Treasure	58.8	10.4	57.5	13.6	28.2
WA008039	58.3	10.7	60.1	12.3	27.7
Vida	58.2	10.5	58.9	14.2	28.6
BZ604-026	55.2	10.6	60.3	12.0	26.8
WA008008	54.4	10.4	58.8	13.1	27.4
Zak	51.9	10.6	59.3	13.3	28.9
Nick	51.7	10.3	57.6	12.8	28.7
Centennial	50.6	10.7	59.4	11.9	28.7
Jubilee	50.3	10.7	58.4	11.7	31.5
Cataldo	49.8	10.7	59.2	12.0	29.8
Calorwa	46.4	10.5	57.8	12.4	25.5
BZ604-002	46.3	10.7	59.4	11.0	27.6
Whitebird	40.2	10.6	58.5	12.7	27.2
Mean	56.0	10.6	59.2	12.4	28.7
LSD (P=.05)	9.9	0.2	0.7	NA	2.2
CV	10.7	1.3	0.7	NA	4.7

Planted April 23, harvested August 30, 2011.

Project Title: Stripe rust response to winter wheat varieties and fungicides

Principal Investigator: Bob Stougaard

Project Personnel: Brooke Bohannon

Objectives: To evaluate fungicide efficacy when applied to winter wheat varieties differing in susceptibility to stripe rust.

Materials and Methods:

The factorial treatment arrangement consisted of three fungicide treatments and seven winter wheat varieties that varied in susceptibility to stripe rust (*Puccinia striiformis tritici*). The fungicide treatments included Priaxor, Prosaro, Twinline plus a non-treated control. The winter wheat varieties consisted on Decade, Eddy, Jagalene, Paladin, Tucson, Whetstone, and Yellowstone.

The study site was a conventionally tilled field that had been planted to peas during the previous year. The soil was a Creston silt loam (25-50-25/S-Si-C) with an organic matter content of 4%, a C.E.C of 20, and a pH of 7.5. A preplant application of 30-30-60 was applied on September 22, 2010 , and the wheat varieties were planted 1.5 inches deep on September 28, 2010 at a rate of 80 lb/A. Individual plots consisted of seven, 6-inch rows, 15 feet in length, with each variety-fungicide combination replicated 3 times in a split plot design. Fungicide treatments were the whole plot effect and the varieties were the sub-plot factor.

A topdress application of nitrogen and sulfur (110-0-0-11) was applied on May 13, 2011. Priaxor, Prosaro and Twinline were applied at 4.0, 6.5, and 9.0 oz/A, respectively on June 6 when the plants were in the flag leaf stage and ranged from 22 to 25 inches in height. Treatments were applied with a non-ionic surfactant at 0.125% v/vi n 20 GPA of water using a backpack sprayer equipped with Tee Jet 11002 nozzles. The study was harvested on August 23. Yield, quality, and economic variables were then determined.

Results:

Wheat varieties varied greatly in susceptibility to the disease. On July 1, the most resistant variety was Whetstone, which had an overall infection level of 8 % (Table 1). In contrast, Decade was the most susceptible and had an average infection level of 53 percent. The effect of the disease was so severe that infection level impacted plant height. On average, plant height was reduced by three inches in the presence of the disease.

All three fungicides reduced the incidence of stripe rust, regardless of the level of resistance expressed by the individual cultivar. However, priaxor was the least efficacious. While fungicide reduced the incidence of stripe rust, it did not change the relative ranking of the wheat cultivars. These results demonstrate that stripe rust management requires the use of resistant varieties as well as fungicide applications.

Table 1. Winter wheat response to the main effects of fungicide and variety for stripe rust control, Kalispell, MT 2011

	SR June 7	SR June 17	SR July 1	SR Aug 5	Heading Julian	Height inch	Lodging %	Yield bu/A	Protein %	TWT lb/bu	TKW g	FN sec	Moist %
Fungicide													
Control	25	45	60	95	174	33	0	65	12.34	58	34	401	10
Priaxor	18	28	30	86	173	36	3	98	12.02	59	36	375	11
Prosaro	21	25	14	85	173	35	4	104	12.15	59	37	381	11
Twinline	20	26	14	86	173	35	5	107	12.26	59	37	389	11
LSD	2.78	8.58	11.89	6.29	NS	0.80	NS	3.90	NS	0.50	1.73	NS	NS
Variety													
Decade	16	35	53	96	174	35	1	50	13.47	50	25	420	9
Eddy	12	28	25	92	172	32	0	90	11.63	58	36	362	10
Jagalene	34	47	22	94	172	34	11	91	12.28	60	38	371	10
Paladin	25	31	31	75	175	33	0	91	12.17	61	38	384	12
Tucson	37	44	43	92	174	36	1	96	11.61	61	40	407	10
Whetstone	14	19	8	83	171	33	1	113	12.61	60	36	405	10
Yellowstone	11	15	24	85	176	38	7	124	11.58	61	40	356	13
LSD	5.86	4.38	6.12	4.34	1.03	1.40	4.56	5.10	0.31	0.60	0.97	20.14	0.53

SR: stripe rust, TWT: test weight, TKW: thousand kernel weight, FN: falling number, Moist: grain moisture.

Table 2. Winter wheat response to the interactive effects of fungicide and variety on stripe rust control, Kalispell, MT 2011

	SR June 7	SR June 17	SR July 1	SR Aug 5	Heading Julian	Height inch	Lodging %	Yield bu/A	Protein %	TWT lb/bu	TKW g	FN sec	Moist %
							Control						
Decade	20	58	96	100	176	31	0	13	14.60	50	24	459	10
Eddy	13	43	72	100	172	30	0	47	11.60	56	30	388	10
Jagalene	40	55	43	100	173	32	2	67	12.23	59	36	387	10
Paladin	28	48	63	88	175	31	0	60	12.27	59	36	399	11
Tucson	42	57	70	98	174	33	0	69	11.67	61	37	407	10
Whetstone	18	32	23	87	172	33	0	96	12.60	60	34	409	10
Yellowstone	12	23	50	95	178	37	2	105	11.43	61	38	353	12
							Priaxor						
Decade	10	27	70	92	173	36	0	50	13.27	49	23	395	9
Eddy	7	27	13	88	172	34	0	95	11.53	59	36	352	10
Jagalene	32	50	27	94	172	34	17	92	12.03	60	38	358	10
Paladin	20	22	35	75	176	34	0	93	12.03	61	39	369	13
Tucson	35	43	45	88	174	37	0	103	11.43	61	41	408	11
Whetstone	15	15	4	80	171	34	0	120	12.47	61	36	391	10
Yellowstone	10	13	15	82	175	39	1	134	11.37	62	41	353	13
							Prosaro						
Decade	13	28	20	97	174	35	5	72	12.77	52	27	410	9
Eddy	20	22	10	89	171	33	0	106	11.53	59	38	350	10
Jagalene	27	38	9	91	172	35	7	100	12.37	61	41	360	10
Paladin	30	27	13	68	174	34	0	105	12.03	61	39	374	12
Tucson	35	35	25	87	175	35	0	107	11.80	61	41	402	11
Whetstone	12	17	4	78	171	33	3	118	12.60	60	36	415	10
Yellowstone	13	12	18	83	176	39	14	121	11.93	61	39	354	13
							Twinline						
Decade	20	27	25	94	173	36	0	67	13.23	50	26	414	9
Eddy	7	18	6	89	172	33	0	111	11.87	60	38	358	10
Jagalene	38	43	8	91	172	35	21	105	12.50	60	39	380	10
Paladin	22	27	13	71	175	34	0	105	12.33	61	39	393	13
Tucson	35	40	33	92	174	37	3	106	11.53	61	41	410	10
Whetstone	10	13	3	85	171	33	2	117	12.77	60	36	406	10
Yellowstone	10	12	13	81	176	39	10	136	11.60	62	41	365	14
LSD	NS	8.77	12.25	NS	NS	NS	9.12	10.30	0.62	1.10	1.94	NS	1.05

SR: stripe rust, TWT: test weight, TKW: thousand kernel weight, FN: falling number, Moist: grain moisture.

Project Title: Evaluation of Winter Wheat Cultivars for Agronomic Performance

Principal Investigator: Bob Stougaard

Cooperators: Phil Bruckner and Jim Berg, PSPP, Bozeman

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

Materials and Methods:

The previous crop was peas. A preplant application of 30-30-60 was applied on September 22, 2010. Treatments were seeded 1.5 inches deep on September 28 at a rate of 80 lb/A. Individual plots consisted of seven, 6-inch wide rows, 15 feet in length, with each entry replicated 3 times in a randomized complete block design. A topdress application of nitrogen was applied at 110-0-0 lb/A on May 13, 2011. Heading was recorded when 50 percent of the plants in a plot had half the head exposed. Height measurements were recorded near maturity. The study was harvested August 22. Grain yield, test weight, moisture, and grain protein were then determined.

Results:

The average Julian heading date for the nursery was 176 (June 25). BZ9WM07-1516 and MTS0826 had the earliest (169) and latest (182) heading dates, respectively. Plant heights averaged 36 inches, with Carter being the shortest (28.3) and MTW08168 the tallest (43.7). Lodging was minor, but exceeded 25% for Rampart, Judee and Curlew. Stripe rust was found in the nursery on May 8 and had infected every variety by the end of the season. The average stripe rust infection level was 62.7 percent, with BZ9WM07-1516 being the most susceptible (99%) and Promontory the most resistant (10.7) percent. Stripe rust had a negative impact on grain yield and quality. Yields averaged 66 Bu/A and ranged from a high of 125 Bu/A for Promontory to a low of 12.4 Bu/A for Wahoo. Test weights averaged 57 lb/Bu, and ranged from 46.2 for Wahoo to 62.7 for Promontory and Peregrine. Protein content averaged 12.6% for the nursery. Protein levels were highest for Wahoo (14.8%) and lowest for Accipiter (10.8%).

Summary:

Promontory, Curlew, Yellowstone and Judee displayed high levels of resistance to stripe rust and were among the highest yielding varieties.

Table 1. Agronomic data from the intrastate winter wheat nursery grown at Kalispell, MT. 2011.

Cultivar	Yield (bu/A)	Protein (%)	Test wt. (lb/bu)	Stripe rust (%)	Heading (Julian)	Height (inches)	Lodging (%)
Promontory	125.7	11.1	62.7	10.7	173.0	37.7	11.7
MT08172	120.6	12.0	59.8	32.7	177.3	39.9	0.0
MTW08168	117.0	11.7	57.8	24.3	180.0	43.7	0.0
MTS0808	113.4	13.2	61.3	25.0	176.0	38.5	3.3
Curlew	112.9	13.1	61.3	21.0	177.0	40.6	25.0
MT08146	110.1	12.1	57.6	31.0	176.7	37.1	0.0
MT0990	109.4	11.1	59.7	53.3	178.7	35.2	3.3
Yellowstone	108.4	11.1	60.1	45.0	177.3	38.6	0.0
Judee	106.4	12.2	61.0	31.7	174.7	37.0	25.7
MT08189	106.0	11.4	59.4	39.3	178.7	39.1	3.3
MT0978	102.5	12.6	57.2	58.3	177.7	37.0	16.7
AP 503 CL2	100.1	13.2	62.1	25.0	172.7	33.3	15.0
BZ9W05-2043	97.9	12.5	60.7	30.0	179.0	38.7	3.3
Radiant	96.5	11.7	56.7	20.0	180.7	40.8	0.0
MT0871	91.3	12.4	57.9	56.7	177.0	37.4	1.7
MTCL1067	90.8	12.1	58.4	48.3	176.3	39.8	6.0
SY Wolf	81.0	12.8	60.4	48.3	173.0	36.0	0.0
MTS0819	79.0	12.9	54.9	51.7	178.3	34.6	0.0
Peregrine	78.3	12.2	62.7	65.0	178.3	42.3	1.7
Bynum (CL)	78.0	13.1	62.5	53.3	173.3	40.3	11.0
MTCL1068	71.8	11.7	56.8	60.0	175.3	38.7	0.0
Robidoux	70.8	11.7	56.6	75.0	171.0	35.0	11.7
Jagalene	69.6	12.0	59.9	55.0	173.0	34.1	1.7
MTS0826	69.0	14.1	58.9	50.0	182.7	35.7	0.0
Rampart	67.3	13.1	62.4	78.3	175.0	39.1	28.3
Hyalite (CL)	67.1	12.5	56.8	63.3	173.0	39.2	8.3
Art	61.0	13.3	53.8	70.0	170.0	35.7	0.0
Boomer	57.9	11.7	56.2	73.3	178.7	36.0	0.0
Pryor	54.8	12.4	61.0	73.3	180.3	30.7	0.0
CDC Falcon	54.6	11.5	59.8	80.0	173.3	32.8	0.0
Accipiter	54.3	10.8	61.3	78.3	180.3	33.6	0.0
McGill	53.8	12.2	52.2	88.3	171.3	33.5	4.0
Ledger	49.2	11.6	57.2	83.3	174.0	34.0	0.0
MTCL1003	40.6	12.8	53.8	68.3	177.7	36.4	0.0
Norris (CL)	40.1	12.9	53.1	89.7	173.7	36.9	0.0
Overland	35.0	12.5	53.1	93.3	174.0	35.4	0.0
Bearpaw	34.6	13.9	50.9	90.0	173.7	35.8	1.7
Settler CL	33.3	12.8	52.6	85.0	173.3	33.7	0.0
WB-Matlock	31.9	13.4	57.6	80.0	178.7	34.3	0.0
MT0866	30.1	14.1	54.9	81.7	178.3	34.8	0.0
Broadview	27.3	12.3	58.4	86.3	179.7	31.6	0.0
Genou	26.9	13.2	56.8	83.3	178.3	36.0	0.0

Table 1. (continued)

Cultivar	Yield (bu/A)	Protein (%)	Test wt. (lb/bu)	Stripe rust (%)	Heading (Julian)	Height (inches)	Lodging (%)
Jerry	26.9	12.0	52.7	83.3	179.7	37.5	0.0
BZ9WM07-1516	21.3	14.1	49.2	99.0	169.3	32.2	0.0
Carter	19.4	14.3	57.2	97.7	178.0	28.3	0.0
Decade	15.3	14.5	47.3	92.3	175.0	32.3	0.0
MT0954	13.9	14.0	52.3	86.7	180.0	34.4	0.0
MTS0832	12.6	14.7	55.0	94.7	180.0	35.4	0.0
Wahoo	12.4	14.8	46.2	97.7	174.0	31.4	0.0
MIN	12.4	10.8	46.2	10.7	169.3	28.3	0.0
MAX	125.7	14.8	62.7	99.0	182.7	43.7	28.3
MEAN	66.3	12.6	57.1	62.7	176.3	36.2	3.7
LSD (0.05)	13.8	NA	NA	13.2	2.0	3.4	10.6
CV	12.88	NA	NA	12.80	0.68	5.84	176.03
TRT (pr>f)	0.0001	NA	NA	0.0001	0.0001	0.0001	0.0001

FORAGES

Project Title: 2011 Intrastate Alfalfa Variety Evaluation - Dryland

Project Leader: Heather Mason

Project Personnel: Brooke Bohannon

Objective: To evaluate the yield performance of alfalfa varieties in a northwestern Montana dryland environment.

Results:

Nine alfalfa cultivars were planted at a rate of 5 lb/ac on May 9, 2008 in a randomized complete block design with four replications. The site was not irrigated and was further characterized as a 'dryland' site due to its sandy loam soil texture. Prior to planting, fertilizer at a rate of 44 lb N/ac, 104 lb P/ac, 120 lb K/ac and 20 lb S/ac was broadcast and incorporated.

In the spring of 2011, stands were well established. Two harvests were taken at full bloom stage of the alfalfa crop. Yields at first harvest (July 6, 2011) were slightly above average at 3.16 t/ac (dry matter basis) compared to the previous two years first harvest average at 2.95 t/ac. The second harvest (August 10, 2011) was below average at 1.51 t/ac compared to the previous two years second harvest average at 1.95 t/ac.

Since the start of this evaluation in 2008, none of the nine varieties tested have yielded statistically different from one another, and the same effect was observed in 2011.

Table 1. Stand and yield data from the dryland Intrastate Alfalfa Variety Evaluation, 2011.

Cultivar	MT-ID#	Stand	Harv-1	Harv-2	2011** Total	2010 Total	2009 Total	2008* Total	2008-11 Total	2008-11 % Mean
		% plot	*t/ac*	*t/ac*	*t/ac*	*t/ac*	*t/ac*	*t/ac*	*t/ac*	
Rebound 5.0	MT-398	81	3.63	1.83	5.46	6.23	5.99	0.89	18.58	108
DKA43-13	MT-413	95	3.23	1.75	4.98	6.42	5.98	1.24	18.62	108
54V09	MT-414	70	2.88	1.39	4.27	5.19	5.61	0.97	16.05	93
FSG 229CR	MT-415	93	3.56	1.50	5.06	6.20	6.20	1.30	18.76	109
FSG 429SN	MT-416	80	3.04	1.55	4.59	5.38	5.72	0.99	16.67	97
FSG 408DP	MT-417	79	3.14	1.41	4.54	5.41	5.92	1.03	16.90	98
Ladak-65	MT-2	84	2.85	1.34	4.19	4.88	5.16	0.92	15.15	88
Melton	MT-338	84	3.29	1.58	4.88	5.99	6.18	1.04	18.09	105
Shaw	MT-328	75	2.85	1.28	4.13	5.49	5.54	1.12	16.28	94
mean			3.16	1.51	4.68	5.69	5.81	1.06	17.23	
LSD(0.05)			1.14	0.54	1.63	1.74	1.59	0.44	4.58	

* ,** denotes one harvest , two harvests, respectively

Project Title: 2011 Interstate Alfalfa Evaluation – Irrigated

Project Leader: Heather Mason

Project Personnel: Brooke Bohannon

Objective: To evaluate the yield performance of alfalfa varieties in a high-rainfall northwestern Montana environment

Results:

Nine alfalfa cultivars were planted at a rate of 5 lb/ac on May 9, 2008 in a randomized complete block design with four replications. The site was chosen for its clay loam soil with a high water holding capacity, but was not irrigated. Prior to planting, fertilizer at a rate of 44 lb N/ac, 104 lb P/ac, 120 lb K/ac and 20 lb S/ac was broadcast and incorporated.

In the spring of 2011, stands were well established with minimal weeds. Two harvests were taken, both at full bloom stage. Average yield at first harvest on July 6, 2011 was 2.46 t/ac (dry matter basis), which is slightly lower than the previous two year first harvest average of 2.68 t/ac. A second harvest was taken on August 10, 2011 and the average yield was 1.54 t/ac, also below the previous two year second harvest average of 2.37 t/ac.

The 2010 – 2011 cropping year exhibited cooler than the 60 year average (2^{o}F lower) temperature and above average precipitation levels (3.26 inches). These climatic conditions combined with the alfalfa stand being in the third and final year most likely are accountable for the below average yields.

Since the start of this evaluation in 2008, none of the nine varieties tested have yielded statistically different from one another, and the same effect was observed in 2011.

Table 1. Stand and yield data from the irrigated Intrastate Alfalfa Variety Evaluation, 2011.

Cultivar	MT-ID#	Stand	Harv-1	Harv-2	2011** Total	2010 Total	2009 Total	2008* Total	2008-11 Total	2008-11 % Mean
		% plot	*t/ac*	*t/ac*	*t/ac*	*t/ac*	*t/ac*	*t/ac*	*t/ac*	%
54V09	MT-414	91	2.57	1.66	4.23	6.70	5.95	2.76	17.78	101
DKA43-13	MT-413	90	2.09	1.37	3.45	5.79	5.40	2.26	15.45	88
FSG 229CR	MT-415	93	2.71	1.70	4.41	6.89	5.52	2.98	17.88	102
FSG 408DP	MT-417	94	2.68	1.63	4.31	6.78	5.35	2.89	17.45	99
FSG 429SN	MT-416	89	2.36	1.51	3.87	6.69	5.56	2.72	16.97	97
Ladak-65	MT-2	85	2.33	1.37	3.70	6.46	5.00	2.50	17.66	101
Melton	MT-338	91	2.32	1.62	3.94	6.12	5.68	2.70	18.43	105
Rebound 5.0	MT-398	94	2.52	1.64	4.16	6.27	5.39	2.58	16.88	96
Shaw	MT-328	94	2.54	1.41	3.95	6.60	6.02	2.99	19.55	111
mean		91	2.46	1.54	4.00	6.37	5.54	2.71	17.56	
LSD(0.05)		7.4	0.519	0.314	0.735	1.272	0.793	0.635	4.926	

*,** denotes one harvest, two harvests, respectively

OILSEEDS

Project Title: Statewide Camelina Variety Evaluation

Project Leader: Heather Mason

Project Personnel: Brooke Bohannon

Project Objective: To evaluate seed yield and agronomic performance of 15 camelina varieties in northwestern Montana.

Results:

Fifteen camelina varieties were included in the 2011 statewide evaluations; six commercially available varieties, four varieties developed by Sustainable Oils (SO) and three varieties developed by Great Plains-The Camelina Company (GP) (Table 1). Camelina was seeded on April 26, 2011 into Creston sandy loam at a rate of 4 lb/a and at a depth of 0.5 in under conventional tillage and dryland conditions. Fertilizer (150-30-120-24) was broadcast and incorporated prior to planting. The plots were direct combine harvested on August 15, 2011.

Good camelina stand establishment was obtained with an average of 30 plants/ft^2. The time to flowering for camelina varieties averaged 63 days after planting (June 28), with the crop reaching average harvest maturity approximately 35 days later (August 2), a total of 98 days after planting. Plant height averaged 42.0 inches, ranging from 38.8 to 43.8 inches. There was little to no shatter observed in the entire evaluation. Lodging was minimal, with an average of 1.3, ranging from 1.0 to 1.8 (on a scale of 0-9).

Differences in seed yield and test weight were significant among varieties included in this year's evaluation. On average, camelina yielded 2,303 lb/ac, and test weights were 51.8 lb/bu. The three highest yielding varieties were GP-10 (50.1 bu/ac), GP-42 (49.7 bu/ac), and Blaine Creek (48.5 bu/ac). Differences in oil yield and content among varieties were also significant. Average oil yield among all varieties was 778 lb/a. The three highest oil yielding varieties were GP-10 (895 lb/ac), GP-42 (873 lb/ac), and Blaine Creek (865 lb/ac). Oil content of camelina seed averaged 33.8%, ranging from 32.7% to 34.6%.

Fatty acid composition of varieties differed for all variables (Table 2). Overall, camelina oil was comprised of approximately 48% polyunsaturated fat, 39% monounsaturated fat and 9% saturated fat.

Summary:

Camelina seed yields in 2011 (2303 lb/ac) are comparable with those from 2010 (2313 lb/ac). Above average precipitation and cooler temperatures may have helped to increase the length of the seed-filing period, resulting in higher camelina seed yield.

Future Plans:

With continued variety development and release, evaluations will be conducted in order to identify varieties best suited to northwest Montana.

2011 Statewide Camelina Variety Evaluation Kalispell, MT

Seed Date:	04/26/2011	**Soil Type:**	Sandy loam	**Harvest Date:**	08/15/2011
Seeding Rate:	4 lb/ac in 6-in rows	**Soil Test:**	NA		
Previous Crop:	Barley	**Fertilizer:**	150-30-120-24 spring broadcast application		
Tillage:	Converntional	**Herbicides:**	None		
Irrigation:	None	**Insecticides:**	None		

Table 1. Performance of camelina varieties tested in the 2011 Montana Statewide Camelina Variety Evaluation at Northwestern Agricultural Research Center, Kalispell, MT

Variety	Seed Yield	Test Weight	Seed Yield	Oil	Oil Yield	Moisture	Protein	Plant Height	Lodging	Plant Count	Days to Flower	Harvest Maturity
	lb / ac	*lb / bu*	*bu / ac*	*%*	*lb / ac*	*%*	*%*	*in*	*0 - 9*	*per ft²*	*days after planting*	
GP-10	**2633** ††	52.6	50.1	33.9	895	7.2	27.0	44	2	35	63	98
GP-42	**2609**	52.4	49.7	33.5	873	7.1	26.8	43	2	30	63	98
Blaine Creek	**2519**	52.0	48.5	34.3	865	7.0	27.2	43	1	34	62	98
Calena	**2409**	52.2	46.2	34.2	824	6.6	26.9	40	1	33	62	98
C10-BZ-SB7-7	**2373**	52.1	45.5	33.9	802	7.1	27.4	42	1	27	66	98
GP-12	**2351**	51.5	45.6	34.4	808	6.3	27.8	39	1	34	62	98
Ligena	**2333**	51.5	45.4	33.6	782	7.5	27.3	43	2	29	63	98
SO-60	**2331**	51.2	45.5	32.7	760	7.8	26.9	41	1	27	60	98
Clearwater Hy 101	2267	51.4	44.1	34.0	771	7.2	26.7	41	1	34	63	98
SO-30	2233	52.4	42.6	33.4	746	7.2	26.7	44	2	25	64	98
SO-50	2181	52.2	41.8	33.4	727	6.9	27.0	42	1	25	64	98
Suneson	2172	52.2	41.7	34.0	736	6.9	27.1	42	2	26	62	98
SO-40	2148	51.0	42.1	33.8	726	7.0	26.9	44	1	34	63	98
C10-BZ-SB7-6	2048	50.1	40.9	34.6	708	6.3	27.1	40	2	27	62	98
Yellowstone	1911	51.6	37.0	33.2	631	7.3	28.2	44	2	22	65	98
Average	2303	51.8	44.5	33.8	778	7.0	27.1	42	1	30	63	98
LSD (α=0.05)	332.2	0.68	6.34	0.86	55.1	0.72	0.50	5.6 ns	0.6 ns	31.8 ns	2.0	ns

Seed and oil yields, and test weights are adjusted to 8% moisture content.

Seed protein, seed oil and oil yield are reported on a dry matter basis.

†† Indicates highest yielding variety.

bold indicates varieties yielding equal to highest yielding variety based on Fisher's protected LSD at P< 0.05.

ns denotes non-significant effects.

Lodging visually estimated on a score from 0 to 9 (0=none, 9=all plants laying flat).

Table 2. Fatty acid constitutes of camelina varieties tested in the 2011 Montana Statewide Camelina Variety Evaluation at Northwestern Agricultural Center, Kalispell, MT

Variety	Palmitic Acid C16:0	Stearic Acid C18:0	Arachidic Acid C20:0	Behenic Acid C22:0	Oleic[3] Acid C18:1	Gadoleic[3] Acid C20:1	Erucic[3] Acid C22:1	Nervonic[3] Acid C24:1	Linoleic[2] Acid C18:2	α-Linolenic[1] Acid C18:3	Saturated	Mono-unsaturated	Poly-unsaturated
	%	%	%	%	%	%	%	%	%	%	%	%	%
Blaine Creek	4.10	2.3	2.0	0.4	19.3	17.5	3.8	0.6	12.0	37.6	8.5	40.1	46.9
C10-BZ-SB7-6	4.73	2.4	1.8	0.4	18.3	15.9	3.2	0.6	16.5	34.6	9.1	37.5	48.9
C10-BZ-SB7-7	4.20	2.3	1.9	0.4	18.2	17.6	3.6	0.6	12.8	38.1	8.4	38.4	48.4
Calena	4.42	2.3	2.0	0.4	18.1	17.1	3.7	0.6	13.9	36.6	8.7	38.1	48.5
Clearwater Hy 101	4.08	2.2	2.0	0.4	19.5	17.8	3.9	0.6	11.9	37.6	8.4	40.4	46.6
GP-10	4.35	2.2	2.0	0.4	19.2	17.6	3.7	0.6	13.9	36.2	8.8	39.3	47.4
GP-12	4.58	2.4	1.8	0.4	18.8	16.2	3.3	0.6	14.5	35.9	8.8	37.8	48.6
GP-42	4.48	2.2	2.1	0.4	18.8	17.4	3.7	0.6	14.5	35.5	8.9	38.7	47.8
Ligena	4.25	2.2	2.0	0.4	18.7	17.6	3.7	0.6	13.9	36.9	8.5	39.0	47.8
SO-30	4.44	2.2	2.2	0.5	18.8	17.6	3.9	0.6	14.2	35.6	8.8	38.9	47.7
SO-40	4.28	2.1	2.1	0.4	18.7	17.2	3.9	0.6	13.9	36.3	8.7	39.3	47.6
SO-50	4.63	2.3	2.1	0.4	18.9	17.4	3.7	0.6	14.7	34.8	9.0	38.5	48.0
SO-60	4.18	2.2	2.1	0.5	19.9	18.6	4.0	0.6	12.4	37.1	8.5	40.5	46.5
Suneson	4.39	2.2	2.0	0.4	18.9	17.0	3.6	0.6	14.1	36.2	8.7	38.9	47.8
Yellowstone	4.09	2.1	1.9	0.4	19.7	17.1	3.5	0.6	13.1	38.7	8.1	39.1	47.7
Average	4.35	2.2	2.0	0.4	18.9	17.3	3.7	0.6	13.8	36.5	8.7	38.9	47.8
LSD (α=0.05)	0.28	0.09	0.10	0.02	0.71	1.00	0.28	0.03	1.65	1.37	0.33	1.31	1.03

Fatty acid composition reported on a dry matter basis of the whole seed.

[1, 2, 3] Omega-3, omega-6 and omega-9 fatty acids, respectively.

Project title: 2010 – 2011 National Winter Canola Variety Evaluation

Project leader: Heather Mason

Project personnel: Brooke Bohannon

Objectives: To evaluate seed yield and agronomic performance of twenty-one winter canola varieties in northwestern Montana.

Results:

Twenty-one varieties (Table 1) were seeded into fine loam on August 23, 2010. The field was previously seeded to alfalfa and was prepared for planting with conventional tillage. Fertilizer (44-37-41) was broadcast and incorporated prior to seeding. No pesticides were applied and the trial was not irrigated.

Good fall stand establishment was achieved (4-6 leaf stage) prior to the first killing frost (< 24^{o}F) on October 23, 2010. The average fall stand rating was 8.0 (on a scale of 0 = no stand, to 10 = excellent stand). The average winter survival was 95 percent and the average stand vigor received a score of 4 (on a scale of 1= no vigor to 5 = high vigor). The average flower and maturity dates were May 26, 2011 and August 9, 2011, respectively. Minimal lodging and shatter were observed in the entire evaluation.

Differences in seed yield and test weight were significant among varieties. On average, winter canola yielded 3,773 lb/ac with a test weight of 51.3 lb/bu. Six of the twenty-one varieties yielded statistically equivalent to the highest yielding variety 'Visby' (4,774 lb/ac or 51.2 lb/bu). Average oil content was 41.1 %, ranging from 45.8% (Durola) to 36.7% DKW4110.

Summary:

Although the 2010 – 2011 crop successfully wintered over, winter canola remains a marginal crop for this region.

Future Plans:

The National Winter Canola Variety Evaluations will be continued as long as interest in winter canola persists in northwestern Montana.

2010 - 2011 National Winter Canola Variety Evaluation, Kalispell, MT

Seed Date:	08/23/2010	**Irrigation:**	None	**Harvest Date:**	08/17/2011
Seeding Rate:	5 lb/ac	**Soil Test:**	82-6-71-34 (07/07/2010)	**Harvest Method:**	Direct Cut
Previous Crop	Alfalfa	**Fertilizer:**	44-37-40		
Herbicides:	None	**Soil Type:**	Fine loam		
Insecticides:	None	**Tillage:**	Conventional		

Table 1. Performance of winter canola varieties and breeding lines tested in the 2010-2011 National Winter Canola Variety Evaluation at Northwestern Agricultural Research Center, Kalispell, MT

Variety	Seed Yield	Test Weight	Seed Yield	Oil Content	Moisture content	Stand	Vigor	Survival	Days to Flower	Days to Maturity	Plant Height	Lodging	Shatter
	lb/ac	lb/bu	bu/ac	%	%	1-10	1-5	0-100%	dap	dap	in	1-100%	1-100%
Visby	**4774** ††	51.2	93	41.7	6.8	8.0	4	95	263	341	72.0	5	2
Baldur	**4557**	51.5	89	41.7	7.4	8.7	4	98	264	342	65.3	17	5
Dimension	**4368**	49.6	88	44.5	8.2	9.0	5	92	266	342	73.0	3	3
HyC154W	**4328**	51.5	84	40.2	7.4	8.3	4	100	267	343	67.0	5	5
Claremore CL	**4300**	51.1	84	40.5	6.8	7.7	4	95	271	342	72.0	5	3
Safran	**4275**	50.8	84	41.7	8.0	6.7	4	97	267	342	68.3	7	3
Durola	**4078**	50.4	81	45.8	7.9	8.0	3	100	263	341	67.0	7	7
Hornet	3888	52.4	74	41.5	6.8	6.7	4	93	267	341	68.7	18	7
Dynastie	3871	51.6	75	42.7	7.3	8.0	3	93	264	343	72.3	30	10
Wichita	3849	51.2	75	42.0	6.3	8.3	4	93	264	340	65.7	10	7
Athena	3838	51.2	75	41.3	7.5	8.7	4	100	264	341	68.0	3	2
Amanda	3767	52.5	72	41.4	7.2	6.3	4	98	272	341	63.3	12	3
Sitro	3720	52.0	72	41.3	7.3	7.0	4	95	263	340	67.0	18	7
DKW4410	3687	50.6	73	38.4	7.4	8.3	4	90	271	339	63.7	30	17
Flash	3537	47.8	74	40.8	9.9	9.0	4	90	271	344	70.3	12	5
DKW4715	3462	51.4	67	41.5	6.4	8.7	3	93	264	341	66.3	17	8
HPX7228	3436	52.0	66	38.1	6.7	8.3	4	97	264	340	68.0	37	22
HPX7341	3213	52.6	61	39.5	6.6	7.7	4	93	267	339	72.0	25	13
Riley	3071	51.6	60	40.9	6.1	8.7	4	90	264	341	70.3	17	8
DKW4615	2917	51.9	56	40.7	6.0	7.3	3	98	269	339	64.7	23	17
DKW4110	2292	52.3	44	36.7	6.7	7.7	4	85	263	340	63.3	8	7
Average	3773	51.3	73.7	41.1	7.2	8.0	4	95	266	341	68.0	15	8
LSD (0.05)	877.31	1.95	16.60	2.70	1.11	2.04 *ns*	1.4 *ns*	12.7 *ns*	3.6	3.1 *ns*	5.77	21.4 *ns*	12.3 *ns*

Seed and test weights are adjusted to 8% moisture content.

Seed oil content is reported on a dry matter basis.

†† Indicates highest yielding variety.

bold indicates varieties yielding equal to highest yielding variety based on Fisher's protected LSD at P< 0.05.

ns denotes non-significant effects.

Lodging visually estimated on a score from 0 to 9 (0=none, 9=all plants laying flat).

Project Title: Statewide Spring Canola Variety Evaluation

Project Leader: Heather Mason

Project Personnel: Brooke Bohannon

Project Objective: To evaluate seed yield and agronomic performance of eighteen canola varieties, two brown mustards and a yellow mustard, in northwestern Montana.

Results:

Eighteen varieties of canola (Table 1) were seeded at 6.5 lb/a (0.5 in depth) to a Creston sandy loam soil under dryland conditions. Plots were seeded April 25, 2011 using a double disc plot seeder. Fertilizer (150-30-120-24) was broadcast and incorporated prior to planting. The plots were direct combine harvested on August 30, 2011.

Time to flowering for canola varieties averaged 66 days after planting (July 1), with the crop reaching harvest maturity approximately 47 days later (August 17), a total of 113 days after planting. Average plant height was 54 in, ranging from 51 to 62 in. Lodging and shatter were minimal in most plots.

Differences in seed yield and test weight were significant among varieties included in the evaluation. On average, canola yielded 2,435 lb/ac, and test weights were 50.8 lb/bu with ten of the eighteen varieties yielding statistically equivalent to the highest yielding varieity 'DKL 70-07'. The three highest yielding varieties were 'DKL 70-07' (2,965 lb/ac), 'DKL 55-55' (2,940 lb/ac), and 'HyClass 947' (2,846 lb/ac). Differences in oil content and yield among varieties were also significant. Average oil content was 44.1%, ranging from 41.5% (Arriba) to 45.5% (HyClass 921). Oil yield ranged from 824 lb/ac (UISC00.3.1.17) to 1335 lb/ac (DKL55-55), with an average of 1126 lb/ac.

Varieties differed in saturated fat (palmitic acid), monounsaturated fat (oleic acid an omega-9 fatty acid) and polyunsaturated fats (linoleic acid an omega-6 fatty acid and α- linolenic acid an omega-3 fatty acid). NX4 106RR was the highest in oleic acid.

The data for the mustard varieties are separate from the canola data (Table 1). As expected, mustard varieties were lower yielding than canola. Oasis CL, a canola quality brown mustard, had a similar oil content and fatty acid profile as *B. napus* canola varieties (Table 2).

Summary:

Overall canola yields were up from 2010 (1,607 lb/ac) and similar to the yields from 2009 (2,489 lb/a). No disease problems were noted.

Future Plans:

With continued variety development and release, further canola evaluations will be conducted in order to identify varieties best suited to our growing region.

2011 Statewide Canola Variety Evaluation, Kalispell, MT

Seeding Date:	4/26/2011	**Fertilizer:**	150-30-120-24 spring application	**Harvest Method:**	Direct Cut
Seeding Rate:	6.5 lb/ac in 6-in. rows	**Herbicides:**	None		
Tillage:	Conventional	**Insecticides:**	Warrior II at 1.92 oz/ac on 07/21/2011		
Irrigation:	None	**Harvest Date:**	8/30/2011		
Soil Type:	Sandy Loam				

Table 1. Performance of canola varieties and breeding lines tested in the 2011 Montana Statewide Canola Variety Evaluation at Northwestern Agricultural Research Center, Kalispell, MT

Variety	Herbicide System	Type	Seed Yield	Test Weight	Seed Yield	Oil Content	Moisture	Oil Yield	Protein Content	Days to Flower		Days to Maturity		Stand	Shatter	Lodging	Plant Height
			lb/ac	*lb/bu*	*bu/ac*	*%*	*%*	*lb/ac*	*%*	*days*	*date*	*days*	*date*	*plants/ft²*		*0 to 9*	*in*
DKL 70-07	RR	HY	**2965** ††	50.8	58.4	44.8	5.2	1328	26.2	65	Jun 30	114	Aug 18	20	0	1	54
DKL 55-55	RR	HY	**2940**	50.2	58.6	45.4	5.3	1335	26.3	65	Jun 30	115	Aug 19	20	4	1	58
InVigor 5440	LL	HY	**2856**	51.4	55.6	43.2	5.5	1237	27.3	68	Jul 3	114	Aug 18	21	1	1	55
HyClass 947	RR	HY	**2846**	50.3	56.5	44.9	5.4	1280	26.3	66	Jul 1	114	Aug 18	22	4	1	54
HyClass 940	RR	HY	**2817**	50.5	55.8	44.5	5.3	1254	26.8	66	Jul 1	112	Aug 16	16	8	1	61
InVigor 8440	LL	HY	**2759**	50.7	54.5	43.6	5.5	1204	27.2	65	Jun 30	112	Aug 16	21	3	1	54
DKL 51-45	RR	HY	**2671**	49.9	53.5	44.1	5.4	1185	26.6	65	Jun 30	113	Aug 17	16	5	1	54
DKL 30-42	RR	HY	**2636**	50.6	52.1	43.8	5.2	1158	27.3	65	Jun 30	113	Aug 17	16	4	1	55
InVigor L150	LL	HY	**2621**	50.8	51.6	44.0	5.3	1155	27.3	69	Jul 4	114	Aug 18	20	8	1	51
InVigor L130	LL	HY	**2606**	51.2	50.9	43.5	5.4	1133	27.4	66	Jul 1	111	Aug 15	22	5	1	52
HyClass 955	RR	HY	**2579**	50.5	51.1	44.7	5.1	1156	27.0	66	Jul 1	113	Aug 17	22	5	1	53
HyClass 921	RR	HY	2483	50.8	48.9	45.5	5.4	1132	25.7	66	Jul 1	115	Aug 19	21	4	1	51
DKL 72-55	RR	HY	2480	50.4	49.2	44.9	5.1	1120	27.0	67	Jul 2	114	Aug 18	14	5	1	53
NX4 106RR	RR	OP	2350	51.8	45.4	43.8	5.5	1029	27.2	70	Jul 5	112	Aug 16	20	4	1	49
HyClass 988	RR	HY	2219	49.1	45.1	44.8	5.6	995	26.4	68	Jul 3	116	Aug 20	17	3	1	56
DKL 52-41	RR	HY	2128	49.6	42.8	43.4	5.4	928	28.7	67	Jul 2	114	Aug 18	21	10	1	53
Arriba	-	OP	2016	51.1	39.5	41.5	5.3	838	28.7	66	Jul 1	115	Aug 19	15	10	2	52
UISC00.3.1.17	-	OP	1902	50.6	37.6	43.2	5.3	824	27.6	66	Jul 1	114	Aug 18	15	5	2	51
Average			2435	50.8	48.0	44.1	5.3	1126	27.1	66	Jul 1	113	Aug 17	19 ns	5 ns	1	54
LSD (α=0.05)			431.2	0.41	8.39	1.13	0.18	206.8	0.74	1.2		2.2		9.9	5.0	0.2	3.6
Brown mustard:																	
Oasis CL[1]	CL	OP	1345	49.9	26.9	42.1	5.1	567	28.6	64	Jun-29	113	Aug-17	15	9	1	54
Pacific Gold[1]	-	OP	2004	52.2	38.4	40.2	5.2	804	27.8	63	Jun-28	106	Aug-10	20	8	1	59
Yellow mustard:																	
IdaGold[2]	-	OP	1972	54.1	36.5	25.0	5.2	492	33.5	57	Jun-22	105	Aug-9	21	0	3	57

Seed and test weights are adjusted to 8% moisture content.

Percent grain protein and oil content presented on a dry matter basis.

†† Indicates highest yielding variety.

bold Indicates varieties yielding equal to the highest yielding variety based on Fisher's protected LSD at P<0.05

[1] *Brassica juncea*

[2] *Sinapis alba*

Herbicide System: RR - Roundup, LL - LibertyLink, CL - CLEARFIELD, - indicates no herbicide system available

Type: Hy - Hybrid, OP - Open-pollinated

Table 2. Fatty acid compostion of canola varieties grown in the 2011 Montana Statewide Variety Evaluation at Northwestern Agricultural Reserach Center, Kalispell, MT

Variety	Palmitic Acid C16:0	Stearatic Acid C18:0	Oleic Acid C18:1	Linoleic Acid C18:2	α-Linolenic Acid
	%	%	%	%	%
Arriba	4.5	2.6	68.3	20.2	6.7
DKL 30-42	4.1	2.5	68.5	19.6	6.0
DKL 51-45	4.3	2.4	69.6	19.9	6.7
DKL 52-41	3.7	2.6	69.2	18.2	6.4
DKL 55-55	3.8	2.4	71.0	18.8	5.7
DKL 70-07	4.0	2.5	69.7	19.1	5.2
DKL 72-55	3.9	2.5	70.3	19.0	5.6
HyClass 921	3.9	2.3	69.7	19.3	6.3
HyClass 940	3.8	2.9	73.8	16.9	5.4
HyClass 947	3.9	2.4	70.2	19.2	6.3
HyClass 955	4.0	2.5	70.1	19.0	6.1
HyClass 988	4.0	2.9	71.8	18.0	5.5
InVigor 5440	4.0	2.3	67.7	19.3	7.5
InVigor 8440	3.8	2.6	69.9	17.8	6.4
InVigor L130	3.9	2.4	68.1	18.5	7.1
InVigor L150	3.8	2.2	66.6	19.4	7.4
NX4 106RR	3.9	3.4	81.2	15.3	1.3
UISC00.3.1.17	4.0	2.4	66.9	20.2	6.7
Average	4.0	2.5	70.1	18.8	6.0
LSD (α=0.05)	0.17	0.13	1.70	0.59	0.50
Brown mustard:					
Oasis CL[1]	4.2	2.2	68.9	18.9	5.0
Pacific Gold[1]	2.6	1.0	22.4	16.7	8.9
Yellow mustard:					
IdaGold[2]	1.4	3.4	69.2	13.5	-1.4

Fattyacid Constituents reproted on a dry matter basis of the whole seed.

[1] *Brassica juncea*

[2] *Sinapis alba*

PULSES

Project title: Statewide Lentil Variety Evaluation

Project leader: Heather Mason

Project personnel: Brooke Bohannon

Objectives: To evaluate seed yield and agronomic performance of fifteen lentil varieties in northwestern Montana.

Results:

Twenty lentil varieties (Table 1) were seeded into Creston sandy loam soil on April 25, 2011. The field was previously seeded to spring wheat, and was prepared for planting using conventional tillage. Fertilizer (150-30-120-24) was broadcast and incorporated prior to planting. No pesticides were applied and the trial was not irrigated. Seeds, treated with fungicide and inoculated with *Rhizobium sp.*, were sown at a rate of 10-12 seeds/ft^2 at a depth of 1.5 inches. Plots were combine harvested at physiological maturity on August 19, 2011.

Although plots were seeded on approximately the same day as in 2010 the days to flower was slightly delayed. However, the average maturity dates were the same. The average time to flowering was 70 days after planting (July 4) and plants reached grain maturity (10% moisture) an average of 106 days after planting (August 9) (Table 1). Overall the Turkish (red) and Pardina type lentils matured the earliest and the Laird (large green) type lentils matured the latest (Table2.) Canopy height ranged from 7 to 10 in and vine length ranged from 12 to 17 in.

Lentil test weights averaged 63.1 lb/bu (Table 1). Grain yields ranged from 18.8 bu/a (1,230 lb/a) for LC06601228T to 32.0 bu/a (2021 lb/a) for Essex. Overall lentil yield across varieties was 27.5 bu/a (1,739 lb/a). Essex and CDC Redberry were the highest yielding commercially available varieties.

Summary:

The 2011 growing season was cooler and moister than average, which most likely had an adverse impact on the lentil crop. Average grain yield and test weight (1739 lb/a and 63.1lb/bu respectively) were compariable with 2010 yields (2,120 lb/a and 62 lb/bu respectively). 2010 was also a cooler and moister year then average. The last two growing seasons produced yields lower than in 2009 (2,438 lb/a and 70 lb.bu respectively).

Future Plans:

Trials will continue to be conducted each year in order to identify varieties suitable to the region.

2011 Statewide Lentil Variety Evaluation Kalispell, MT

Seed Date:	04/25/2011	**Irrigation:**	None
Harvest Date:	08/19/2011	**Soil Test:**	NA
Seeding Rate:	10 seeds/SF	**Fertilizer:**	150-30-120-24 spring application
Herbicides:	NA	**Soil Type:**	Sandy loam
Insecticides:	NA		

Table 1. Performance of lentil varieties grown in the 2011 Montana Statewide Lentil Variety Evaluation at Northwestern Agricultural Research Center, Kalispell, MT

Variety	Grain Yield	Grain Yield	Test Weight	Days to Flower	Days to Maturity	Canopy Height at Pod-Fill	Vine Length	Canopy Height at Maturity	1,000 Kernel Weight
	bu/ac	*lb/ac*	*lb/bu*	*days after planting*	*days after planting*	*in*	*in*	*in*	*g*
Large Green									
CDC Greenland	**30.0 †**	1,799	60.0	71	109	11	16	7	65
LC07600517L	**28.2 †**	1,739	61.6	71	107	11	17	7	60
Merrit	**27.6 †**	1,672	60.6	67	108	11	15	7	60
Riveland	**25.2 †**	1,495	59.4	68	107	11	16	10	70
Medium Green									
LC01602300R	**31.1 †**	1,956	62.9	72	106	12	16	9	49
CDC Richlea	**29.4 †**	1,810	61.6	72	107	12	14	8	52
CDC Vantage	**27.6 †**	1,741	63.0	70	107	11	16	6	50
Brewer	23.3	1,415	60.9	68	106	10	16	5	55
CDC Meteor	21.7	1,361	62.6	71	106	10	16	8	50
Small Green									
Essex	**32.0 ††**	2,021	63.1	71	111	12	16	9	44
LC03601590E	**31.1 †**	1,991	64.0	72	105	11	14	9	39
Eston	**27.0 †**	1,733	64.1	71	107	10	13	8	35
Red									
CDC Redberry	**31.6 †**	2,021	64.0	71	107	13	17	10	43
Crimson	**31.4 †**	2,025	64.5	71	104	11	13	7	35
LC01602062T	**24.5 †**	1,553	63.5	68	108	11	17	7	39
CDC Impact CL	21.9	1,418	64.7	70	104	10	13	8	36
LC06601228T	18.8	1,230	65.6	67	105	11	15	7	46
Spanish Brown (Pardina)									
Pardina	**31.3 †**	2,048	65.3	69	104	9	14	4	40
LC01602245P	**31.6 †**	2,069	65.3	69	104	9	13	5	40
LC02601144P	**25.7 †**	1,682	65.4	69	108	11	12	7	39
Average	27.5	1,739	63.1	70	106	11	15	7	47
LSD (α=0.05)	7.98	505.9	0.37	2.0	2.3	1.7	2.0	2.3	2.1

Grain yield and test weight are adjusted to 10% grain moisture content.

†† Indicates highest yielding variety.

† Indicates varietys yielding equal to the hightest yielding variety based on Fishers's Protected LSD at P<0.05.

CL indicates varieties that are Clearfield® herbicide resistant.

Table 2. Lentil variety characteristics

Variety	Type	Seed Coat	Cotyledon	Resistance	Seed Size[1]	Maturity[2]
CDC Greenland	Laird	Green	Yellow	as	Large	Late
LC07600517L	Laird	Green	Yellow	-	Large	Moderate
Riveland	Laird	Green	Yellow	as	Large	Moderate
Merrit	Brewer	Mottled Green	Yellow	PEMV	Large	Late
Brewer	Brewer	Mottled Green	Yellow	-	Med. Large	Moderate
LC01602300R	Richlea	Green	Yellow	-	Medium	Moderate
CDC Richlea	Richlea	Green	Yellow	-	Medium	Moderate
CDC Vantage	Richlea	Green	Yellow	as	Medium	Moderate
CDC Meteor	Richlea	Green	Yellow	-	Medium	Moderate
Essex	Eston	Green	Yellow	-	Small	Late
LC03601590E	Eston	Green	Yellow	-	Small	Early
Eston	Eston	Green	Yellow	-	Small	Moderate
CDC Redberry	Turkish	Gray	Red	as/an	Small	Moderate
Crimson	Turkish	Brown	Red	-	Small	Early
LC01602062T	Turkish	Brown	Red	-	Small	Late
CDC Impact CL	Turkish	Gray	Red	as	Small	Early
LC06601228T	Turkish	Brown	Red	-	Small	Early
Pardina	Pardina	Brown	Yellow	-	Small	Early
LC01602245P	Pardina	Brown	Yellow	-	Small	Early
LC02601144P	Pardina	Brown	Yellow	-	Small	Late

[1] - Size classes (g/1000 seeds): Large: > = 60; Medium: 50 - 60; Small < = 50

[2] - Maturity (days): Early < = 105; Moderate 106 - 107; Late > = 108

an: anthrocnose

as: ascochya

PEMV: pea enation mosaic virus