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

ANNUAL REPORT
2013 CROP YEAR

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CLIMATOLOGY

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

Climate Overview for the Crop Year 2013

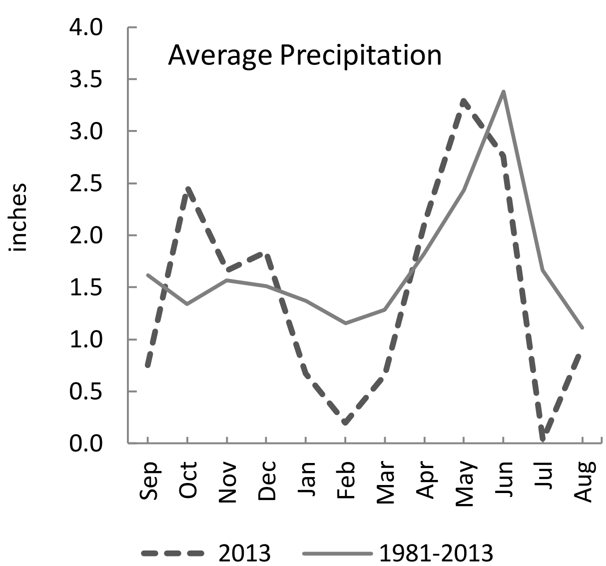
September 1, 2012 to August 31, 2013 represents the 2013 crop year. Total precipitation was 17.37 inches, which is 14% less than the 33 year average of 20.26 inches.

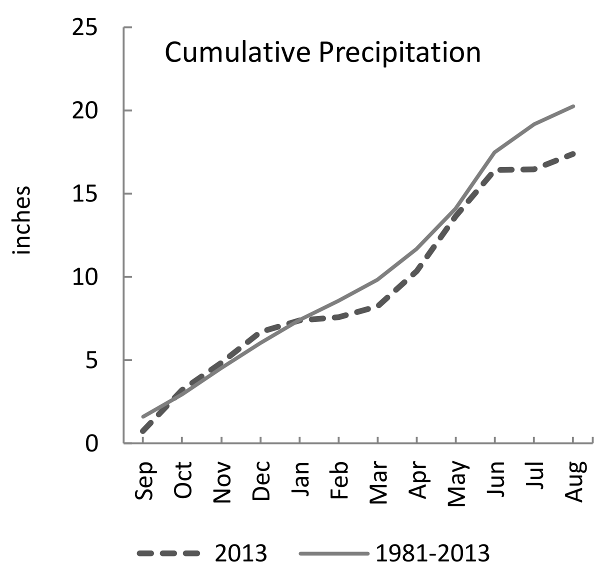
September had 0.75 inches total precipitation, which was less than half the average of 1.62 inches. The following three months, October, November, and December, received fair precipitation. January, February, and March received below average precipitation, with 0.67, 0.20, and 0.66 inches respectively. April and May had slightly above average precipitation. June, July, and August received less than average precipitation. July received 0.03 inches total precipitation, well below its average of 1.66 inches, and making it the second driest month on record.

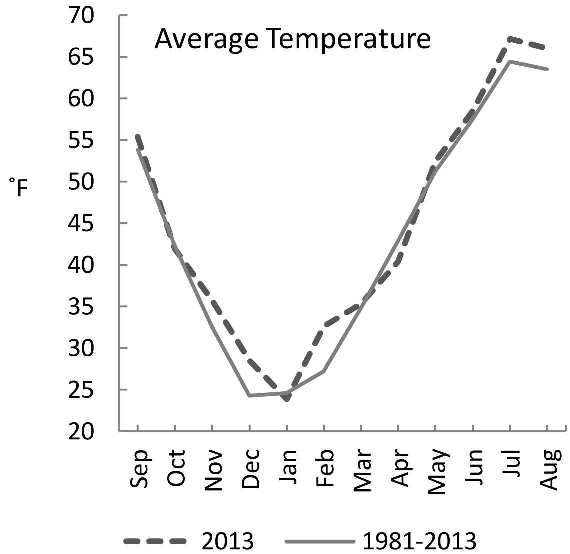
A strong hail storm occurred on July 17, causing much damage to crops.

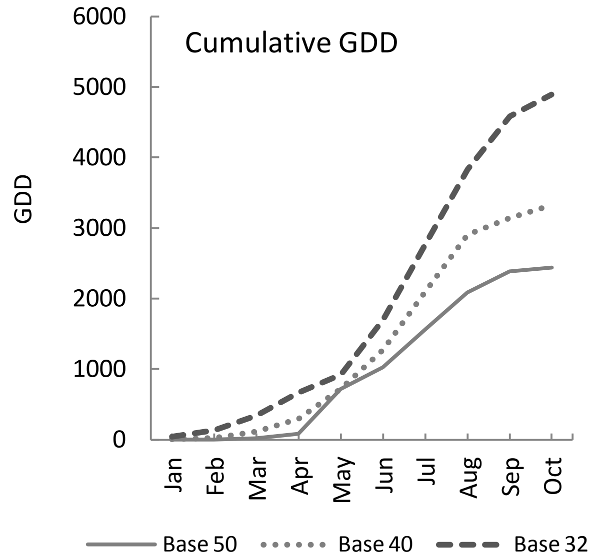
Average temperature for the crop year was 44.8˚F, which is up from the 33 year average of 43.2˚F. Nine of the months had temperatures slightly above average. July 2 had the highest temperature of 91˚F. The low temperature of 6˚F was on January 3 and 4.

The last killing frost was 31˚F on May 23. The first killing frost was 30˚F on September 27. The frost free period was 126 days. The average frost free period is 123 days. The growing degree days (GDD) from January through October were as following: base 32 was 4,895; base 40 was 3,326; base 50 was 2,439.






Average Temperature
˚F
70
65
60
55
50
45
40
35
30
25
20
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
2013
1981-2013


Cumulative GDD
GDD
6000
5000
4000
3000
2000
1000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Base 50
Base 40
Base 32

Summary of Climatic Data by Months for the 2013 Crop Year: September 2012 - August 2013
and Averages for the Years 1980-2013 at the
Northwestern Agricultural Research Center, Kalispell, Montana

	Sept. 2012	Oct. 2012	Nov. 2012	Dec. 2012	Jan. 2013	Feb. 2013	Mar. 2013	Apr. 2013	May 2013	June 2013	July 2013	Aug. 2013	
Precipitation (inches)													Total
Current Year	0.75	2.46	1.66	1.84	0.67	0.20	0.66	2.12	3.29	2.76	0.03	0.93	17.37
1981-2013	1.62	1.34	1.57	1.51	1.37	1.15	1.29	1.83	2.43	3.38	1.66	1.11	20.26
Average Temperature (F°)													Average
Current Year	55.4	41.9	35.8	28.5	23.9	32.6	35.3	40.4	52.4	58.5	67.2	66.0	44.8
1980-2013	53.8	42.2	32.5	24.3	24.6	27.2	34.9	43.0	51.2	57.5	64.4	63.5	43.2

Last killing frost[1] in spri	
Spring 2013	31°F May 23
Median for 1980-2013	May 20
First killing frost[1] in fall	
Fall 2013	30°F September 27
Median for 1980-2013	September 21
Frost Free Period	
Avg. 1980-2013	123
Growing Degree Days April - August 2013	
Base 50	1,679.0
Base 40	2,790.5
Base 32	3,871.5
Maximum summer temperature	91°F July 2, 2013
Minimum winter temperature	6°F Jan 3 & 4, 2013

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

MAXIMUM / MINIMUM TEMPERATURES BY MONTH & DAY

JANUARY 2013- DECEMBER 2007

2013

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	27	20	38	33	41	30	62	28	42	24	58	37	85	58	85	49	78	40	55	39	42	29	39	33
2	27	20	45	27	46	38	64	28	50	32	64	45	91	59	72	55	87	44	54	38	53	26	35	33
3	26	6	45	21	52	35	67	32	61	33	67	48	90	60	59	51	81	54	52	32	45	31	38	9
4	23	6	41	23	36	14	60	30	61	33	61	38	87	53	72	47	66	47	51	24	36	27	18	4
5	22	7	41	32	36	14	58	31	65	30	65	40	84	52	78	51	84	50	52	25	3	27	18	-1
6	30	14	44	34	36	18	52	39	70	32	73	50	79	48	79	46	76	54	56	30	36	28	13	-7
7	34	28	44	28	36	26	52	32	73	35	78	52	77	49	82	47	78	53	62	28	38	26	7	-14
8	38	28	37	25	44	23	45	28	74	38	76	48	82	50	83	51	76	49	62	29	39	28	1	-14
9	44	28	39	23	47	23	45	20	75	42	72	49	75	46	86	52	62	52	46	32	46	28	7	-5
10	42	31	31	22	46	25	43	25	76	42	73	40	78	48	85	55	72	47	55	27	46	29	12	6
11	31	19	36	23	40	30	48	36	75	44	74	43	87	51	86	54	78	47	46	31	35	32	23	12
12	24	7	33	25	48	28	48	28	78	41	75	46	81	44	85	55	85	48	52	30	42	33	31	15
13	20	7	39	32	43	30	50	29	83	53	65	48	78	55	87	57	86	46	47	26	41	33	31	17
14	17	8	47	23	55	24	42	27	80	45	61	46	76	45	83	47	81	49	54	24	51	37	37	31
15	M	M	40	24	55	34	44	24	72	32	58	47	80	41	85	48	85	45	55	22	46	29	40	33
16	27	7	41	26	55	30	40	26	62	39	71	39	85	49	89	49	84	46	52	23	39	31	42	31
17	27	8	38	28	45	31	40	18	64	36	77	46	85	51	88	59	76	43	44	32	39	27	43	23
18	24	10	34	22	45	28	45	23	60	46	79	48	85	49	84	56	70	44	52	29	43	28	41	23
19	34	10	41	22	39	21	52	27	59	47	80	51	86	51	85	50	51	45	53	27	45	40	40	11
20	29	7	39	24	43	21	46	38	67	47	59	46	87	50	86	55	62	34	52	28	52	29	22	9
21	27	7	36	26	49	29	54	30	72	46	52	45	87	50	82	43	69	37	56	27	33	8	23	15
22	35	13	33	28	40	26	35	19	75	38	61	40	89	49	83	44	64	40	57	27	29	9	21	17
23	21	11	37	31	36	18	40	24	66	31	69	42	88	52	81	50	62	39	57	28	31	9	33	21
24	39	18	33	26	35	17	45	27	53	33	67	54	88	49	82	50	59	43	57	27	32	12	38	30
25	43	28	37	27	37	15	59	30	57	39	68	54	90	52	85	52	53	42	55	28	33	13	30	11
26	42	29	40	30	43	21	66	35	58	36	69	49	89	52	82	53	52	40	52	29	32	14	28	26
27	37	27	37	27	51	25	71	37	67	40	70	53	90	50	79	46	58	30	41	32	24	22	31	15
28	35	27	39	27	52	26	62	47	63	40	77	52	86	45	81	49	53	32	50	30	26	22	35	15
29	33	21			52	34	59	33	58	40	82	55	81	53	79	49	59	45	38	17	28	25	32	26
30	32	21			53	29	51	27	66	46	80	55	78	50	86	49	53	44	40	16	38	28	35	24
31	37	32			59	29			55	45			79	47	78	43			45	17			40	23
AVG	30.9	16.8	38.8	26.4	45.0	25.5	51.5	29.3	65.7	38.9	69.4	46.9	84.0	50.3	81.8	50.4	70.0	44.3	51.6	27.5	37.4	25.3	28.5	15.2

MAXIMUM TEMPERATURE	91 °F	MINIMUM TEMPERATURE	-14

"M": missing data

Summary of Temperature Data at the Northwestern Agricultural Research Center

On a Crop Year Basis September 1980 - August 31, 2013

AVERAGE TEMPERATURE BY YEAR AND MONTH

In degrees Farenheit

YEAR	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	MEAN
1980-81	54.1	45.3	35.8	32.2	30.1	31.3	38.5	44.5	52.5	53.8	62.8	66.4	45.6
1981-82	55.3	43.2	36.0	27.0	21.6	24.5	37.5	39.4	49.8	59.8	61.1	63.0	43.2
1982-83	53.4	41.0	29.1	25.9	30.3	33.8	37.9	42.4	51.9	57.6	59.6	65.4	44.0
1983-84	50.4	42.9	36.6	11.1	27.6	32.4	38.3	42.2	48.7	56.4	65.3	64.6	43.0
1984-85	49.5	40.0	32.6	20.6	19.2	19.0	30.8	44.8	53.7	57.6	68.3	60.2	41.4
1985-86	47.8	40.8	18.6	18.3	25.4	25.6	40.6	43.8	53.7	63.9	59.9	66.1	42.0
1986-87	50.2	43.0	30.3	24.9	22.2	27.9	35.0	47.8	55.6	61.6	62.9	59.8	43.4
1987-88	56.1	43.3	35.3	25.4	20.5	30.3	37.8	45.7	51.4	60.9	63.7	63.9	44.5
1988-89	53.4	43.4	36.3	23.3	27.5	12.4	28.8	44.2	49.6	59.8	65.4	61.9	42.2
1989-90	52.7	42.7	35.8	25.3	30.5	24.5	34.8	45.2	49.8	57.2	65.2	64.8	44.0
1990-91	59.1	41.9	36.1	16.5	18.3	34.6	32.8	42.4	50.3	55.1	64.0	65.2	43.0
1991-92	54.4	40.6	32.1	29.3	28.7	34.5	39.7	45.1	53.5	55.5	61.2	61.8	44.7
1992-93	51.1	44.7	33.1	19.4	14.7	18.4	33.7	43.6	56.0	56.5	56.6	59.7	40.6
1993-94	51.4	44.4	25.0	27.4	32.9	20.6	37.5	45.4	54.0	57.3	66.4	63.0	43.8
1994-95	56.3	42.8	29.7	27.1	23.6	33.7	33.1	42.6	51.6	56.3	63.1	59.5	43.3
1995-96	54.9	41.1	34.9	26.7	17.4	24.0	29.0	43.2	46.6	58.5	65.4	62.5	42.0
1996-97	52.3	42.1	27.3	19.8	19.8	28.0	32.3	38.3	52.3	57.8	62.8	63.8	41.4
1997-98	55.6	43.7	33.0	27.9	25.1	33.0	34.9	44.5	54.1	56.0	68.4	65.6	45.2
1998-99	59.7	42.3	37.0	27.4	30.4	32.2	37.5	41.6	48.8	55.8	60.9	65.5	44.9
1999-00	51.3	42.9	38.1	31.0	25.8	26.3	36.9	43.4	50.4	56.2	63.9	63.4	44.1
2000-01	52.0	33.5	27.5	18.4	24.0	20.6	33.6	40.5	53.4	54.8	63.1	64.6	40.5
2001-02	57.3	42.0	36.6	27.0	27.2	25.7	25.0	41.6	47.5	57.7	67.2	60.4	42.9
2002-03	54.4	37.5	32.6	30.6	28.8	28.1	33.4	44.5	50.5	60.1	69.1	66.9	44.7
2003-04	55.5	46.3	27.3	24.2	21.1	27.6	39.5	45.1	51.0	57.3	66.0	64.0	43.7
2004-05	52.3	43.4	33.8	29.4	20.6	30.6	36.1	43.9	51.8	55.3	62.6	62.8	43.6
2005-06	51.0	43.6	32.6	18.1	33.2	24.2	35.5	43.9	52.6	60.7	69.1	63.8	44.0
2006-07	53.5	44.0	32.5	24.1	22.1	28.3	37.7	42.7	52.6	59.0	72.0	62.3	44.2
2007-08	53.6	40.3	32.6	26.2	19.7	30.2	32.9	37.8	47.0	55.6	65.1	63.6	42.1
2008-09	52.4	41.7	33.3	18.0	21.5	24.5	26.2	41.8	53.3	59.2	67.1	66.1	42.1
2009-10	60.1	38.9	35.3	18.0	26.4	31.4	37.9	41.2	47.1	56.0	61.9	61.4	43.0
2010-11	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
2011-12	56.2	43.3	31.6	28.0	26.4	28.2	36.7	45.2	48.8	54.9	65.2	63.1	44.0
2012-13	55.4	41.9	35.8	28.5	23.9	32.6	35.3	40.4	52.4	58.5	67.2	66.0	44.8
MEAN	53.8	42.2	32.5	24.3	24.6	27.2	34.9	43.0	51.2	57.5	64.4	63.5	43.2

Mean temperature for all years = 43.2

Precipitation by Day for Crop Year September 2012- August 2013
Northwest Agriculture Research Center, Kalispell Montana

DAY	SEPT. 2012	OCT. 2012	NOV. 2012	DEC. 2012	JAN. 2013	FEB. 2013	MAR. 2013	APR. 2013	MAY 2013	JUNE 2013	JULY 2013	AUG. 2013
1	0.00	0.00	0.03	0.08	0.00	0.05	0.00	0.00	0.10	0.01	0.00	0.00
2	0.00	0.00	0.17	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34
3	0.00	0.09	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.05	0.00	0.35
4	0.00	0.00	0.12	0.02	0.00	0.00	0.01	0.00	0.00	0.05	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
6	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.08
7	0.32	0.00	0.07	0.11	0.12	0.00	0.02	0.06	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.41	0.04	0.00	0.00	0.41	0.00	0.12	0.00	0.00
9	0.00	0.00	0.00	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.03	0.00
10	0.00	0.00	0.00	T	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.03	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.02	0.00	0.08	0.00	0.00
13	0.00	0.05	0.08	0.07	0.06	0.01	0.15	0.17	0.00	0.03	0.00	0.01
14	0.00	0.03	0.01	0.00	0.02	0.00	0.00	0.20	0.05	0.04	0.00	0.00
15	0.00	0.03	0.03	0.02	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.20	0.00	0.02	0.00	0.00	0.27	0.00	0.04	0.00	0.00	0.00
18	0.00	0.00	0.07	0.00	0.00	0.13	0.00	0.00	0.70	0.10	0.00	0.00
19	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.04	0.03	0.00	0.00
20	0.00	0.16	0.04	0.00	0.00	0.01	0.00	0.20	0.00	1.56	0.00	0.00
21	0.00	0.01	0.83	0.01	0.00	0.00	0.13	0.73	0.00	0.28	0.00	0.00
22	0.00	0.00	T	0.03	0.00	0.00	0.01	0.00	0.07	0.00	0.00	0.00
23	0.00	0.25	0.00	0.04	0.00	0.00	0.02	0.00	1.46	0.01	0.00	0.00
24	0.00	0.04	0.08	0.13	0.03	0.00	0.00	0.00	0.05	0.26	0.00	0.05
25	0.00	0.01	0.00	0.06	0.00	0.00	0.00	0.00	0.10	0.11	0.00	0.00
26	0.00	0.04	0.10	0.05	0.16	0.00	0.00	0.00	0.00	0.03	0.00	0.00
27	0.00	0.16	0.00	0.01	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.31	0.00	0.04	0.07	0.00	0.01	0.00	0.11	0.00	0.00	0.00
29	0.00	0.32	0.00	0.00	0.03		0.00	0.00	0.03	0.00	0.00	0.00
30	0.00	0.19	0.03	0.01	0.00		0.03	0.17	0.51	0.00	0.00	0.10
31		0.07		0.00	0.00		0.00		0.03		0.00	0.00
TOTAL	0.75	2.46	1.66	1.84	0.67	0.20	0.66	2.12	3.29	2.76	0.03	0.93

Total Precipitation: 17.37 inches

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		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	0.56	21.84
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
2011-12	0.91	2.46	0.46	0.40	1.08	1.15	1.16	1.35	2.11	7.11	1.41	0.56	20.16
2012-13	0.75	2.46	1.66	1.84	0.67	0.20	0.66	2.12	3.29	2.76	0.03	0.93	17.37
MEAN	1.62	1.34	1.57	1.51	1.37	1.15	1.29	1.83	2.43	3.38	1.66	1.11	20.26

Mean monthly 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	1.38	0.01	1.41	2.21	1.73	8.44	0.26	0.60	2.28	2.20	1.45	1.42	23.39
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	0.46	0.40	20.30
2012	1.08	1.15	1.16	1.35	2.11	7.11	1.41	0.56	0.75	2.46	1.66	1.84	22.64
2013	0.67	0.20	0.66	2.12	3.29	2.76	0.03	0.93	2.65	0.36	2.00	0.99	16.66
MEAN	1.37	1.15	1.27	1.84	2.46	3.36	1.62	1.12	1.66	1.31	1.60	1.44	20.14

YEAR 2013 - 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	27	20	0.0	0.0	0.0
2	27	20	0.0	0.0	0.0
3	26	6	0.0	0.0	0.0
4	23	6	0.0	0.0	0.0
5	22	7	0.0	0.0	0.0
6	30	14	0.0	0.0	0.0
7	34	28	0.0	0.0	1.0
8	38	28	0.0	0.0	3.0
9	44	28	0.0	2.0	6.0
10	42	31	0.0	1.0	5.0
11	31	19	0.0	0.0	0.0
12	24	7	0.0	0.0	0.0
13	20	7	0.0	0.0	0.0
14	17	8	0.0	0.0	0.0
15	M	M	0.0	0.0	0.0
16	27	7	0.0	0.0	0.0
17	27	8	0.0	0.0	0.0
18	24	10	0.0	0.0	0.0
19	34	10	0.0	0.0	1.0
20	29	7	0.0	0.0	0.0
21	27	7	0.0	0.0	0.0
22	35	13	0.0	0.0	1.5
23	21	11	0.0	0.0	0.0
24	39	18	0.0	0.0	3.5
25	43	28	0.0	1.5	5.5
26	42	29	0.0	1.0	5.0
27	37	27	0.0	0.0	2.5
28	35	27	0.0	0.0	1.5
29	33	21	0.0	0.0	0.5
30	32	21	0.0	0.0	0.0
31	37	32	0.0	0.0	2.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
30.9	16.8	0.0	5.5	38.5

February

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	38	33	0.0	0.0	3.5
2	45	27	0.0	2.5	6.5
3	45	21	0.0	2.5	6.5
4	41	23	0.0	0.5	4.5
5	41	32	0.0	0.5	4.5
6	44	34	0.0	2.0	7.0
7	44	28	0.0	2.0	6.0
8	37	25	0.0	0.0	2.5
9	39	23	0.0	0.0	3.5
10	31	22	0.0	0.0	0.0
11	36	23	0.0	0.0	2.0
12	33	25	0.0	0.0	0.5
13	39	32	0.0	0.0	3.5
14	47	23	0.0	3.5	7.5
15	40	24	0.0	0.0	4.0
16	41	26	0.0	0.5	4.5
17	38	28	0.0	0.0	3.0
18	34	22	0.0	0.0	1.0
19	41	22	0.0	0.5	4.5
20	39	24	0.0	0.0	3.5
21	36	26	0.0	0.0	2.0
22	33	28	0.0	0.0	0.5
23	37	31	0.0	0.0	2.5
24	33	26	0.0	0.0	0.5
25	37	27	0.0	0.0	2.5
26	40	30	0.0	0.0	4.0
27	37	27	0.0	0.0	2.5
28	39	27	0.0	0.0	3.5
29	0	0	0.0	0.0	0.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
37.4	25.5	0.0	14.5	96.5

March

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	41	30	0.0	0.5	4.5
2	46	38	0.0	3.0	10.0
3	52	35	1.0	6.0	11.5
4	36	14	0.0	0.0	2.0
5	36	14	0.0	0.0	2.0
6	36	18	0.0	0.0	2.0
7	36	26	0.0	0.0	2.0
8	44	23	0.0	2.0	6.0
9	47	23	0.0	3.5	7.5
10	46	25	0.0	3.0	7.0
11	40	30	0.0	0.0	4.0
12	48	28	0.0	4.0	8.0
13	43	30	0.0	1.5	5.5
14	55	24	2.5	7.5	11.5
15	55	34	2.5	7.5	12.5
16	55	30	2.5	7.5	11.5
17	45	31	0.0	2.5	6.5
18	45	28	0.0	2.5	6.5
19	39	21	0.0	0.0	3.5
20	43	21	0.0	1.5	5.5
21	49	29	0.0	4.5	8.5
22	40	26	0.0	0.0	4.0
23	36	18	0.0	0.0	2.0
24	35	17	0.0	0.0	1.5
25	37	15	0.0	0.0	2.5
26	43	21	0.0	1.5	5.5
27	51	25	0.5	5.5	9.5
28	52	26	1.0	6.0	10.0
29	52	34	1.0	6.0	11.0
30	53	29	1.5	6.5	10.5
31	59	29	4.5	9.5	13.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
45.0	25.5	17.0	92.0	208.0

April

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	62	28	6.0	11.0	15.0
2	64	28	7.0	12.0	16.0
3	67	32	8.5	13.5	17.5
4	60	30	5.0	10.0	14.0
5	58	31	4.0	9.0	13.0
6	52	39	1.0	6.0	13.5
7	52	32	1.0	6.0	10.0
8	45	28	0.0	2.5	6.5
9	45	20	0.0	2.5	6.5
10	43	25	0.0	1.5	5.5
11	48	38	0.0	4.0	11.0
12	48	28	0.0	4.0	8.0
13	50	29	0.0	5.0	9.0
14	42	27	0.0	1.0	5.0
15	44	24	0.0	2.0	6.0
16	40	26	0.0	0.0	4.0
17	40	18	0.0	0.0	4.0
18	45	23	0.0	2.5	6.5
19	52	27	1.0	6.0	10.0
20	46	38	0.0	3.0	10.0
21	54	30	2.0	7.0	11.0
22	35	19	0.0	0.0	1.5
23	40	34	0.0	0.0	5.0
24	45	41	0.0	3.0	11.0
25	59	30	4.5	9.5	13.5
26	66	35	8.0	13.0	18.5
27	71	37	10.5	15.5	22.0
28	62	47	6.0	14.5	22.5
29	59	46	4.5	12.5	20.5
30	51	27	0.5	5.5	9.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
51.5	30.6	69.5	182.0	326.0

May

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	42	24	0.0	1.0	5.0
2	50	32	0.0	5.0	9.0
3	61	33	5.5	10.5	15.0
4	61	33	5.5	10.5	15.0
5	65	30	7.5	12.5	16.5
6	70	32	10.0	15.0	19.0
7	73	35	11.5	16.5	22.0
8	74	38	12.0	17.0	24.0
9	75	42	12.5	18.5	26.5
10	76	42	13.0	19.0	27.0
11	75	44	12.5	19.5	27.5
12	78	41	14.0	19.5	27.5
13	83	53	18.0	28.0	36.0
14	80	45	15.0	22.5	30.5
15	72	32	11.0	16.0	20.0
16	62	39	6.0	11.0	18.5
17	64	36	7.0	12.0	18.0
18	60	46	5.0	13.0	21.0
19	59	47	4.5	13.0	21.0
20	67	47	8.5	17.0	25.0
21	72	46	11.0	19.0	27.0
22	75	38	12.5	17.5	24.5
23	66	31	8.0	13.0	17.0
24	53	33	1.5	6.5	11.0
25	57	39	3.5	8.5	16.0
26	58	36	4.0	9.0	15.0
27	67	40	8.5	13.5	21.5
28	63	40	6.5	11.5	19.5
29	58	40	4.0	9.0	17.0
30	66	46	8.0	16.0	24.0
31	55	45	2.5	10.0	18.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
65.7	38.9	249.0	430.5	634.5

YEAR 2013- GROWING DEGREE DAYS JANUARY THROUGH OCTOBER
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	58	37	4.0	9.0	15.5
2	64	45	7.0	14.5	22.5
3	67	48	8.5	17.5	25.5
4	61	38	5.5	10.5	17.5
5	65	40	7.5	12.5	20.5
6	73	50	11.5	21.5	29.5
7	78	52	15.0	25.0	33.0
8	76	48	13.0	22.0	30.0
9	72	49	11.0	20.5	28.5
10	73	40	11.5	16.5	24.5
11	74	43	12.0	18.5	26.5
12	75	46	12.5	20.5	28.5
13	65	48	7.5	16.5	24.5
14	61	46	5.5	13.5	21.5
15	58	47	4.0	12.5	20.5
16	71	39	10.5	15.5	23.0
17	77	46	13.5	21.5	29.5
18	79	48	14.5	23.5	31.5
19	80	51	15.5	25.5	33.5
20	59	46	4.5	12.5	20.5
21	52	45	1.0	8.5	16.5
22	61	40	5.5	10.5	18.5
23	69	42	9.5	15.5	23.5
24	67	54	10.5	20.5	28.5
25	68	54	11.0	21.0	29.0
26	69	49	9.5	19.0	27.0
27	70	53	11.5	21.5	29.5
28	77	52	14.5	24.5	32.5
29	82	55	18.5	28.5	36.5
30	80	55	17.5	27.5	35.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
69.4	46.9	303.5	546.5	783.5

JULY

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	85	58	21.5	31.5	39.5
2	91	59	22.5	32.5	40.5
3	90	60	23.0	33.0	41.0
4	87	53	19.5	29.5	37.5
5	84	52	18.0	28.0	36.0
6	79	48	14.5	23.5	31.5
7	77	49	13.5	23.0	31.0
8	82	50	16.0	26.0	34.0
9	75	46	12.5	20.5	28.5
10	78	48	14.0	23.0	31.0
11	87	51	18.5	28.5	36.5
12	81	44	15.5	22.5	30.5
13	78	55	16.5	26.5	34.5
14	76	45	13.0	20.5	28.5
15	80	41	15.0	20.5	28.5
16	85	49	17.5	27.0	35.0
17	85	51	18.0	28.0	36.0
18	85	49	17.5	27.0	35.0
19	86	51	18.5	28.5	36.5
20	87	50	18.0	28.0	36.0
21	87	50	18.0	28.0	36.0
22	89	49	18.0	27.5	35.5
23	88	52	19.0	29.0	37.0
24	88	49	18.0	27.5	35.5
25	90	52	19.0	29.0	37.0
26	89	52	19.0	29.0	37.0
27	90	50	18.0	28.0	36.0
28	86	45	18.0	25.5	33.5
29	81	53	17.0	27.0	35.0
30	78	50	14.0	24.0	32.0
31	79	47	14.5	23.0	31.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
84.0	50.3	535.5	825.0	1073.0

AUGUST

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	85	49	17.5	27.0	35.0
2	72	55	13.5	23.5	31.5
3	59	51	5.0	15.0	23.0
4	72	47	11.0	19.5	27.5
5	78	51	14.5	24.5	32.5
6	79	46	14.5	22.5	30.5
7	82	47	16.0	24.5	32.5
8	83	51	17.0	27.0	35.0
9	86	52	19.0	29.0	37.0
10	85	55	20.0	30.0	38.0
11	86	54	20.0	30.0	38.0
12	85	55	20.0	30.0	38.0
13	87	57	22.0	31.5	39.5
14	83	47	16.5	25.0	33.0
15	85	48	17.5	26.5	34.5
16	89	49	19.5	27.5	35.5
17	88	59	23.5	32.5	40.5
18	84	56	20.0	30.0	38.0
19	85	50	17.5	27.5	35.5
20	86	55	20.5	30.5	38.5
21	82	43	16.0	22.5	30.5
22	83	44	16.5	23.5	31.5
23	81	50	15.5	25.5	33.5
24	82	50	16.0	26.0	34.0
25	85	52	18.5	28.5	36.5
26	82	53	17.5	27.5	35.5
27	79	46	14.5	22.5	30.5
28	81	49	15.5	25.0	33.0
29	79	49	14.5	24.0	32.0
30	86	49	18.0	27.5	35.5
31	78	43	14.0	20.5	28.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
81.8	50.4	521.5	806.5	1054.5

SEPTEMBER

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	78	40	14.0	9.0	27.0
2	87	44	18.0	15.0	33.0
3	81	54	17.5	17.5	35.5
4	66	47	8.0	6.5	24.5
5	84	50	17.0	17.0	35.0
6	76	54	15.0	15.0	33.0
7	78	53	15.5	15.5	33.5
8	76	49	13.0	12.5	30.5
9	62	52	7.0	7.0	25.0
10	72	47	11.0	9.5	27.5
11	78	47	14.0	12.5	30.5
12	85	48	17.5	16.5	34.5
13	86	46	18.0	16.0	34.0
14	81	49	15.5	15.0	33.0
15	85	45	17.5	15.0	33.0
16	84	46	17.0	15.0	33.0
17	76	43	13.0	9.5	27.5
18	70	44	10.0	7.0	25.0
19	51	45	0.5	0.0	16.0
20	62	34	6.0	1.0	16.0
21	69	37	9.5	4.5	21.0
22	64	40	7.0	2.0	20.0
23	62	39	6.0	1.0	18.5
24	59	43	4.5	1.0	19.0
25	53	42	1.5	0.0	15.5
26	52	40	1.0	0.0	14.0
27	58	30	4.0	0.0	13.0
28	53	32	1.5	0.0	10.5
29	59	45	4.5	2.0	20.0
30	53	44	1.5	0.0	16.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
70.0	44.3	306.0	242.5	755.0

OCTOBER

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	55	39	2.5	7.5	15.0
2	54	38	2.0	7.0	14.0
3	52	32	1.0	6.0	10.0
4	51	24	0.5	5.5	9.5
5	52	25	1.0	6.0	10.0
6	56	30	3.0	8.0	12.0
7	62	28	6.0	11.0	15.0
8	62	29	6.0	11.0	15.0
9	46	32	0.0	3.0	7.0
10	55	27	2.5	7.5	11.5
11	46	31	0.0	3.0	7.0
12	52	30	1.0	6.0	10.0
13	47	26	0.0	3.5	7.5
14	54	24	2.0	7.0	11.0
15	55	22	2.5	7.5	11.5
16	52	23	1.0	6.0	10.0
17	44	32	0.0	2.0	6.0
18	52	29	1.0	6.0	10.0
19	53	27	1.5	6.5	10.5
20	52	28	1.0	6.0	10.0
21	56	27	3.0	8.0	12.0
22	57	27	3.5	8.5	12.5
23	57	28	3.5	8.5	12.5
24	57	27	3.5	8.5	12.5
25	55	28	2.5	7.5	11.5
26	52	29	1.0	6.0	10.0
27	41	32	0.0	0.5	4.5
28	50	30	0.0	5.0	9.0
29	38	17	0.0	0.0	3.0
30	40	16	0.0	0.0	4.0
31	45	17	0.0	2.5	6.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
51.6	27.5	51.5	181.0	310.5

Julian Date Calendar for Year 2013

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	32	60	91	121	152	182	213	244	274	305	335
2	2	33	61	92	122	153	183	214	245	275	306	336
3	3	34	62	93	123	154	184	215	246	276	307	337
4	4	35	63	94	124	155	185	216	247	277	308	338
5	5	36	64	95	125	156	186	217	248	278	309	339
6	6	37	65	96	126	157	187	218	249	279	310	340
7	7	38	66	97	127	158	188	219	250	280	311	341
8	8	39	67	98	128	159	189	220	251	281	312	342
9	9	40	68	99	129	160	190	221	252	282	313	343
10	10	41	69	100	130	161	191	222	253	283	314	344
11	11	42	70	101	131	162	192	223	254	284	315	345
12	12	43	71	102	132	163	193	224	255	285	316	346
13	13	44	72	103	133	164	194	225	256	286	317	347
14	14	45	73	104	134	165	195	226	257	287	318	348
15	15	46	74	105	135	166	196	227	258	288	319	349
16	16	47	75	106	136	167	197	228	259	289	320	350
17	17	48	76	107	137	168	198	229	260	290	321	351
18	18	49	77	108	138	169	199	230	261	291	322	352
19	19	50	78	109	139	170	200	231	262	292	323	353
20	20	51	79	110	140	171	201	232	263	293	324	354
21	21	52	80	111	141	172	202	233	264	294	325	355
22	22	53	81	112	142	173	203	234	265	295	326	356
23	23	54	82	113	143	174	204	235	266	296	327	357
24	24	55	83	114	144	175	205	236	267	297	328	358
25	25	56	84	115	145	176	206	237	268	298	329	359
26	26	57	85	116	146	177	207	238	269	299	330	360
27	27	58	86	117	147	178	208	239	270	300	331	361
28	28	59	87	118	148	179	209	240	271	301	332	362
29	29		88	119	149	180	210	241	272	302	333	363
30	30		89	120	150	181	211	242	273	303	334	364
31	31		90		151		212	243		304		365

CEREALS

Project Title: Barley Off Station – 2013

Project Leader: Bob Stougaard

Project Personnel: Brooke Bohannon and Tom Blake

Objective: To evaluate the agronomic performance of barley varieties grown in environments representative of northwestern Montana.

Results:

Yields ranged from 112.5 bu/A for Conrad, to 17.9 bu/A for Haxby. Low yields for Haxby were attributed to greater susceptibility to hail damage caused by a storm on July 17. Test weights ranged from 52.7 lb/bu for Hockett to 49.3 lb/bu for Tradition. Conrad had the highest protein at 15.4% while both MT090180 and MT090190 had the lowest protein at 12.9%. Significant differences also were observed for each of the other agronomic traits including lodging, which ranged from zero to as high as 56.7% for Cowboy. Cowboy had a height of 48.3 inches compared to MT070159, which was the shortest variety at 37.8 inches. Julian heading dates ranged from 184 to 189 (Table2).

Summary:

Most barley varieties performed well despite the hail damage.

Table 1. Materials and Methods -Barley off station - 2013

Seeding Date:	5/6/13	Fertilizer:	150-40-110-20
Julian Date:	126	Herbicide:	5/31/13
Seeding Rate:	48 lb/A		Affinity TankMix 0.6 OZ/A, MCPE
Previous Crop:	Barley		0.5 PT/A, Axial 16.4 FL OZ/A
Tillage:	Conventional		
Irrigation:	None	Harvest Date:	9/16/13
Soil Type:	Creston Sil	Julian Date:	259
Soil Test:	162-14-142		

Table 2. Barley off station

Treatment	HD Julian	HT in	LOD %	YLD bu/A	PRO %	PLMP %	TWT lb/bu
Conrad	186	40.6	13.3	112.5	15.4	98.6	52.0
Geraldine	189	41.2	10.0	106.6	14.2	98.1	51.2
MT070158	185	40.0	0.0	106.0	14.6	99.1	51.9
Harrington	186	41.9	16.7	105.8	14.3	98.4	51.3
MT090180	187	41.6	0.0	105.0	12.9	97.4	51.1
Eslick	188	38.7	10.0	102.2	14.4	97.0	51.2
Metcalfe	187	42.3	16.7	101.9	14.6	98.3	51.6
MT090190	186	40.8	0.0	100.3	12.9	97.7	50.6
MT070159	184	37.8	0.0	98.2	13.8	99.1	51.2
Champion	185	41.6	0.0	97.6	14.4	97.7	52.3
MT080279	184	38.2	0.0	95.2	14.2	98.6	51.3
Hockett	184	40.6	3.3	92.9	14.4	98.3	52.7
Gallatin	184	41.6	1.7	87.3	14.9	96.0	52.0
Tradition	184	45.4	0.0	85.4	13.8	94.2	49.3
Cowboy	186	48.3	56.7	80.6	15.2	97.7	50.5
Haxby	184	40.4	0.0	17.9	15.0	95.5	51.2
Mean	185.5	41.3	8.0	93.5	14.3	97.6	51.4
CV	0.4	3.3	114.4	10.9	3.5	0.9	0.8
LSD	1.3	2.3	15.3	17.1	0.8	1.5	0.7
Pr>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Footnotes: HD: heading, HT: height, LOD: lodging, YLD: Yield, PRO: protein, PLMP: percent plumps, TWT: test weight

Project Title:	Fungicide Evaluation in Spring Wheat - 2013
Project Leader:	Bob Stougaard
Project Personnel:	Brooke Bohannon
Objective:	To evaluate the effects of fungicide and application timing on stripe rust control in spring wheat.

Results:

Seven fungicide treatments were evaluated for stripe rust control in spring wheat. The experimental design was a randomized complete block with three replications. The variety Hank was planted at a rate of 80 lb/A on April 16. Applications were made at the two tiller stage (2T) on May 31 and at the flag leaf stage (FL) on June 11.

Crop injury was minor with all treatments, ranging from 0.0% to 6.7% on June 7, and 0.0% to 5.0% on June 14 (Table 2). Significant differences were observed among fungicide treatments for the control of stripe rust. The flag leaf application timing provided the most complete control of stripe rust. Although percent stripe rust control differed between application timings, no significant differences were observed in yield, percent protein, test weight or falling numbers.

Summary:

These results confirm that early fungicide applications fail to provide effective disease control.

Table 1. Material and Methods - Fungicide evaluation in spring wheat - 2013

Seeding Date:	4/16/13	Fertilizer:	150-40-110-20
Julian Date:	106	Herbicide:	5/20/13
Seeding Rate:	80 lb/A		Affinity TankMix 0.6 OZ/A, MCPE
Previous Crop:	Barley		0.5 PT/A, Axial 16.4 FL OZ/A
Tillage:	Conventional	Insecticide:	6/27/13
Irrigation:	None		Warrior II 1.5 FL OZ/A
Soil Type:	Creston Sil	Harvest Date:	8/19/13
Soil Test:	151-10-278-58	Julian Date:	231

Table 2. Fungicide evalution for crop tolerance and stripe rust control in spring wheat - 2013.

	Treatment	Rate		Timing	Crop injury 6/7	Crop injury 6/14	SR 7/15	YLD	PRO	TWT	FN
					———%———		%	bu/A	%	lb/bu	sec
1	Check				3.3	0.0	93.0	82.6	13.5	56.3	293
2	Stratego	4	FL OZ/A	2T	3.3	0.0	85.3	86.5	13.3	56.9	291
3	Quilt	13.7	FL OZ/A	2T	6.7	3.3	72.0	82.8	13.2	56.8	302
4	Prosaro 421	6.5	FL OZ/A	2T	6.7	3.3	61.0	86.7	13.4	56.9	294
	Induce 90	0.125	% V/V								
5	Stratego YLD	4	FL OZ/A	2T	0.0	0.0	65.3	92.5	13.3	57.7	276
	Induce 90	0.125	% V/V								
6	Quilt	13.7	FL OZ/A	FL	3.3	1.7	6.7	98.9	13.8	58.1	294
7	Prosaro 421	6.5	FL OZ/A	FL	1.7	1.7	6.7	93.5	13.6	58.4	301
	Induce 90	0.125	% V/V								
8	Stratego YLD	4	FL OZ/A	FL	3.3	5.0	8.0	85.2	13.2	58.5	304
	Induce 90	0.125	% V/V								
	Mean				3.5	1.9	49.8	88.6	13.4	57.5	294.4
	CV				152.5	158.0	16.9	8.1	3.0	1.6	7.0
	LSD				9.5	5.2	14.7	12.6	0.7	1.6	36.3
	PR>F				0.8012	0.3623	0.0001	0.1367	0.6278	0.0706	0.7937

2T: two tiller, FL: flagleaf, SR: stripe rust, YLD: yield, PRO: protein, TWT: test weight, FN: falling number

Project Title:	Effects of Sulfur Fertilizer Sources on Spring Wheat Yield and Quality – 2013
Project Leader:	Bob Stougaard
Project Personnel:	Brooke Bohannon and Grant Jackson
Objective:	To evaluate the effects of sulfur fertilizer sources on spring wheat yield and quality.

Materials and Methods:

Sulfur based fertilizer formulations were compared to evaluate their impact on spring wheat yield and quality. Six different sulfur treatments were applied on April 3 with sulfur applied at a rate of 30 lb/A. Hank hard red spring wheat was seeded at a rate of 80 lbs/A on April 16. The experimental design was a randomized complete block with four replications. Warrior II was applied at 1.5 oz/A on June 27 to control orange wheat blossom midge. Plots were harvested on August 19 to measure grain yield and quality (Table 1).

Results:

Sulfur based fertilizer formulation had no effect on spring wheat yield. Likewise, sulfur treatments had minimal effect on grain quality, except for test weight. Test weights were low and averaged 55 lb/bu (Table 2). The lowest test weight was observed with carbon ammonium sulfate plus ammonium sulfate, while the combination of PKS without N produced the highest test weight. In general, sulfur had no significant impact on spring wheat yield or grain quality.

Table 1. Material and Methods - Effects of sulfur fertilizer sources on spring wheat - 2013

Seeding Date:	4/16/13	Fertilizer:	300-60-60-30
Julian Date:	106	Herbicide:	5/20/13
Seeding Rate:	80 lb/A		Affinity TankMix 0.6 OZ/A, MCPE
Previous Crop:	Barley		0.5 PT/A, Axial 16.4 FL OZ/A
Tillage:	Conventional	Insecticide:	6/27/13
Irrigation:	None		Warrior II 1.5 FL OZ/A
Soil Type:	Creston Sil	Harvest Date:	8/19/13
Soil Test:	151-10-278-58	Julian Date:	231

Table 2. Effects of sulfur fertilizer sources on spring wheat - 2013

Treatment	YLD bu/A	PRO %	TWT lb/bu	MC %
Vitasul (90% S)	83.2	13.9	54.6	9.7
Tiger 90 CR (90% S)	84.1	13.7	54.9	9.7
Ammonium Sulphate (AS)	91.5	13.7	55.0	9.5
Carbon Ammonium Sulphate (CAS)	86.0	13.9	54.6	9.6
Vitasul + AS*	90.0	13.8	54.7	9.6
CAS + AS*	83.4	13.8	54.3	9.8
NPK no S with micronutrients (check)	85.6	13.7	55.1	9.7
PKS no N with micronutrients	87.9	12.8	56.0	9.9
Grand Mean	86.5	13.7	54.9	9.7
CV	8.8	2.4	1.7	1.8
LSD (P=.05)	11.1	0.5	1.4	0.3
Pr>F	0.2254	0.3235	0.0018	0.6963

*equal amounts of S supplied from the two sources

YLD: yield, PRO: Protein, TWT: test weight, MC: moisture

Project Title:	The Effects of Cerone and Lorsban on the Control of the Orange Wheat Blossom Midge in Susceptible and Resistant Spring Wheat -2013
Project Leader:	Bob Stougaard
Project Personnel:	Brooke Bohannon
Objective:	To evaluate the interactive effects of combining Cerone with Lorsban on grain yield and quality in Orange Wheat Blossom Midge (OWBM) susceptible and resistant spring wheat cultivars.

Results:

This study was conducted to compare the treatment effects of Cerone and Lorsban when applied to CAP 400-1, an experimental cultivar with resistance to the OWBM, and Solano, a non-resistant cultivar. The study was planted as a split-plot design with three replications. Cerone treatments were applied at a rate of 0.75 pt/A, at early boot, on June 26. There was heavy dew present and a light drizzle occurred 6 hours later for a total precipitation of 0.03”. Lorsban treatments were applied at a rate of 1 pt/A, at heading, on July 2.

The main effect of PGR and insecticide treatments had a significant effect on heading date, yield and thousand kernel weights (Table 2). Cerone applied alone or in combination with Lorsban, delayed heading by two days and resulted in lower thousand kernel weights. Yields were the highest with the combination of Cerone with Lorsban.

Significant differences were observed with the main effect of cultivar (Table 3). CAP 400-1 afforded complete control of OWBM, and resulted in higher test weight and falling number values than Solano. Solano had higher thousand kernel weights. Although Solano had significantly greater owbm numbers, Solano and CAP 400-1 had similar yields when averaged over PGR and insecticide inputs. However, Interactions were observed for yield (Table 4).

Overall, Cerone plus Lorsban afforded the greatest yield increase for both CAP 400-1 and Solano. However, Solano also benefitted from lorsban applied alone. These results indicate that there could be a synergistic effect to yield by applying lorsban plus cerone, regardless of the variety.

Table 1. Materials and Methods - Effect of Cerone and Lorsban on the control of the OWBM in susceptible and resistant spring wheat - 2013

Seeding Date:	5/6/13	Fertilizer:	150-40-110-20
Julian Date:	126	Herbicide:	5/31/13
Seeding Rate:	80 lb/A		Affinity TankMix 0.6 OZ/A, MCPE 0.5 PT/A, Axial 16.4 FL OZ/A
Previous Crop:	Canola		
Tillage:	Conventional	Fungicide:	6/21/13
Irrigation:	None		Headline 9 FL OZ/A
Soil Type:	Creston Sil	Harvest Date:	9/5/13
Soil Test:	136-10-100	Julian Date:	248

Table 2. Main effect of Cerone and Lorsban inputs on agronomic performance of spring wheat. 2013

Input	SR %	HD Julian	Quack-grass %	HT in	LOD %	OWBM no/spk	YLD bu/A	PRO %	TWT lb/bu	TKW g	FN sec	MC %
Check	3.0	184	1.3	35.5	0	12.2	84.1	15.0	61.6	37.3	376.0	15.0
Cerone	6.2	186	8.5	35.8	0	8.4	83.6	15.2	61.5	36.4	367.3	14.8
Lorsban	4.8	184	7.5	37.3	0	5.7	92.6	14.1	62.3	37.9	361.3	15.2
Cerone & Lorsban	5.3	186	1.5	34.9	0	4.8	100.9	14.9	62.3	36.8	387.5	14.8
LSD	2.4	0.9	14.8	1.9	0	6.1	13.3	1.7	0.8	0.5	54.1	0.3
Pr>F	0.0826	0.0019	0.5403	0.0881	1.0000	0.0895	0.0555	0.4898	0.0837	0.0009	0.6792	0.0585

Table 3. Main effect of cultivar on agronomic performance of spring wheat. 2013

CAP 400-1	1.4	185	2.1	34.9	0	0.0	89.8	14.8	62.4	34.6	413.7	14.6
Solano	8.3	185	7.3	36.8	0	15.5	90.8	14.8	61.5	39.6	332.4	15.3
LSD	1.7	1	8.2	2.2	0	4	4.2	0.6	0.4	0.4	27.3	0.1
Pr>F	0.0001	0.7200	0.1764	0.0799	1.0000	0.0001	0.6260	0.9287	0.0011	0.0001	0.0001	0.0001

Table 4. Effect of Cerone and Lorsban on agronomic performance of spring wheat . 2013

						CAP 400-1						
Check	2.0	184	0.3	35.1	0	0.0	83.0	15.0	62.1	34.5	429.7	14.7
Cerone	2.3	186	3.0	34.2	0	0.0	88.6	15.1	62.2	34.2	410.7	14.4
Lorsban	0.7	184	3.3	36.6	0	0.0	88.8	14.2	62.7	35.4	391.7	14.8
Cerone & Lorsban	0.7	186	1.7	33.7	0	0.0	99.0	15.0	62.6	34.4	422.7	14.5
						Solano						
Check	4.0	184	2.3	35.8	0	24.3	85.3	15.0	61.0	40.1	322.3	15.4
Cerone	10.0	186	14.0	37.4	0	16.8	78.7	15.2	60.8	38.5	324.0	15.1
Lorsban	9.0	184	11.7	38.1	0	11.4	96.4	14.1	62.0	40.4	331.0	15.6
Cerone & Lorsban	10.0	186	1.3	36.1	0	9.6	102.7	14.8	62.1	39.2	352.3	15.2
LSD	3.4	2.1	16.3	4.4	0	7.9	8.4	1.2	0.8	0.8	54.7	0.3
Pr>F	0.0304	0.9860	0.6559	0.8167	1.0000	0.0618	0.0429	0.9799	0.3647	0.1474	0.5560	0.7890

SR: stripe rust, HD: heading, HT: height, LOD: lodging, OWBM: orange wheat blossom midge, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number, MC: moisture

Project Title:	Effects of Chitosan and Lorsban on the Control of Orange Wheat Blossom Midge (OWBM) in Susceptible and Resistant Spring Wheat – 2013
Project Leader:	Bob Stougaard
Project Personnel:	Brooke Bohannon
Objective:	To evaluate the effect of Chitosan and Lorsban on the control of OWBM in susceptible and resistant spring wheat.

Results:

This study was conducted to compare the treatment effects of Chitosan and Lorsban when applied to CAP 400-1, an experimental cultivar with resistance to the OWBM, and Solano, a non-resistant cultivar. The study was planted as a split-plot design with three replications. Chitosan treatments were applied at a rate of 0.5% v/v, at early boot, on June 26. Lorsban treatments were applied at a rate of 1 pt/A, at heading, on July 2.

Cap 400-1 afforded complete control of OWBM. Solano experienced OWBM pressure and a higher rate of stripe rust infection. Chitosan and Lorsban had no effect on yield among the two cultivars and little effect on test weight, protein and thousand kernel weight (Tables 2, 4).

Summary:

Significant differences in agronomic traits varied mostly between cultivars rather than the treatments imposed, with CAP 400-1 outperforming Solano (Table 3).

Table 1. Materials and Methods - Effect of Chitosan and Lorsban - 2013

Seeding Date:	5/6/13	Fertilizer:	150-40-110-20
Julian Date:	126	Herbicide:	5/31/13
Seeding Rate:	80 lb/A		Affinity TankMix 0.6 OZ/A, MCPE
Previous Crop:	Canola		0.5 PT/A, Axial 16.4 FL OZ/A
Tillage:	Conventional	Fungicide:	6/21/13
Irrigation:	None		Headline 9 FL OZ/A
Soil Type:	Creston Sil	Harvest Date:	9/4/13
Soil Test:	136-10-100	Julian Date:	247

Table 2. Main effect of Chitosan and Lorsban inputs on agronomic performance of spring wheat – 2013

	SR	HD	HT	OWBM	YLD	PRO	TWT	TKW	FN	MC
	%	Julian	in	no/spk	bu/A	%	lb/bu	g	sec	%
Check	3.7	186	33.2	8.2	91.5	15.4	61.1	30.6	351.4	13.3
Chitosan	3.8	186	33.4	8.0	90.5	14.9	61.2	29.6	367.1	13.3
Lorsban	4.0	187	33.9	4.3	101.5	15.2	61.6	30.2	367.5	13.2
Chitosan + Lorsban	3.5	187	33.7	6.3	98.3	15.2	61.5	30.4	364.2	13.2
LSD	2.7	2.2	2.1	5.0	9.0	1.3	0.4	2.5	19.6	0.2
Pr>F	0.9707	0.8327	0.8622	0.3063	0.0633	0.7925	0.0476	0.7947	0.2504	0.4602

Table 3. Main effect of cultivar on agronomic performance of spring wheat – 2013

Cap 400	1.3	188	37.6	0.0	104.1	15.2	61.7	30.4	412.3	13.3
Solano	6.2	186	29.5	13.4	86.8	15.1	61.0	30.0	312.8	13.3
LSD	1.9	1.8	0.7	7.7	4.6	0.3	0.4	0.7	17.2	0.2
Pr>F	0.0004	0.0416	0.0001	0.0039	0.0001	0.2714	0.0021	0.2798	0.0001	0.8103

Table 4. Effect of Chitosan and Lorsban inputs on agronomic performance on spring wheat – 2013

					CAP 400-1					
Check	1.3	188	37.7	0.0	100.5	15.4	61.7	30.6	406.7	13.4
Chitosan	2.0	188	37.4	0.0	99.6	14.5	61.7	29.0	421.8	13.3
Lorsban	0.7	188	37.5	0.0	105.9	15.6	61.7	31.2	407.7	13.2
Chitosan + Lorsban	1.3	187	37.8	0.0	110.4	15.4	61.8	30.7	413.1	13.2
					Solano					
Check	6.0	185	28.7	16.3	82.4	15.3	60.4	30.6	296.2	13.3
Chitosan	5.7	185	29.4	16.0	81.3	15.2	60.8	30.2	312.4	13.3
Lorsban	7.3	186	30.2	8.7	97.1	14.7	61.5	29.3	327.2	13.2
Chitosan + Lorsban	5.7	187	29.6	12.7	86.3	15.1	61.2	30.0	315.3	13.3
LSD	3.8	3.6	1.4	15.5	9.3	0.7	0.7	1.4	34.5	0.3
Pr>F	0.6223	0.7019	0.3756	0.8355	0.1331	0.0301	0.1451	0.0353	0.4961	0.7637

SR: stripe rust, HD: heading HT: height, OWBM: orange wheat blossom midge, YLD: Yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number, MC: moisture content

Project Title:	The Effects of Copper and Lorsban on the Control of Orange Wheat Blossom Midge in Susceptible and Resistant Spring Wheat – 2013
Project Leader:	Bob Stougaard
Project Personnel:	Brooke Bohannon
Objective:	To evaluate the interactive effects of combining copper with Lorsban on grain yield and quality in OWBM susceptible and resistant spring wheat cultivars.

Results:

This study was conducted to compare the treatment effects of copper and Lorsban when applied to CAP 400-1, an experimental cultivar with resistance to the midge, and Solano, a non-resistant cultivar. The study was planted as a split-plot design with three replications. Copper treatments were applied at a rate of 0.5 pt/A at early boot on June 26. There was heavy dew present and a light drizzle occurred 6 hours later for a total precipitation of 0.03”. Lorsban treatments were applied at a rate of 1 pt/A at heading on July 2.

The main effect of copper and lorsban treatments had a significant effect on stripe rust and test weight. Stripe rust infection was the highest when treated with copper alone or in combination with Lorsban. Test weights were highest when treated with Lorsban alone and in combination with copper (Table 2).

Cultivar effects were observed. CAP 400-1 had a significantly lower level of stripe rust infection, afforded 100 % control of OWBM and had higher test weight and falling number values relative to Solano (Table 3). Solano was shorter in height and had higher thousand kernel weights. No significant differences were observed for heading, lodging, yield or protein.

No effect of interactions between treatments and cultivars were observed for any of the response variables (Table 4).

Table 1. Materials and Methods - Effect of copper and lorsban on control of the OWBM in susceptible and resitant spring wheat - 2013

Seeding Date:	5/6/13	Fertilizer:	150-40-110-20
Julian Date:	126	Herbicide:	5/31/13
Seeding Rate:	80 lb/A		Affinity TankMix 0.6 OZ/A, MCPE
Previous Crop:	Canola		0.5 PT/A, Axial 16.4 FL OZ/A
Tillage:	Conventional	Fungicide:	6/21/13
Irrigation:	None		Headline 9 FL OZ/A
Soil Type:	Creston Sil	Harvest Date:	9/4/13
Soil Test:	136-10-100	Julian Date:	247

Table 2. Main effect of copper and lorsban inputs on agronomic performance of spring wheat. 2013

	SR	HD	HT	LOD	OWBM	YLD	PRO	TWT	TKW	FN	MC
	%	Julian	in	%	no/spk	bu/A	%	%	%	sec	%
Check	4.5	185	34.5	0.0	5.6	87.8	15.3	61.5	38.0	387.3	14.7
Copper	7.3	185	33.6	0.0	5.9	87.4	15.2	61.7	38.0	402.3	14.8
Lorsban	5.3	185	35.4	0.0	3.7	102.6	15.2	62.1	38.3	403.1	14.7
Copper & Lorsban	8.3	185	34.5	0.0	5.7	91.2	14.7	62.0	37.8	398.1	14.8
LSD	2.5	1.8	1.9	0.0	4.0	24.0	0.7	0.4	2.0	17.6	0.3
Pr>F	0.0327	0.9615	0.2696	1.0000	0.5236	0.4363	0.3415	0.0446	0.9358	0.2098	0.8508

Table 3. Main effect of cultivar on agronomic performance of spring wheat. 2013

CAP 400-1	3.1	185	39.3	0.0	0.0	90.9	15.3	62.1	35.4	450.4	14.4
Solano	9.7	185	29.7	0.0	10.4	93.6	14.9	61.5	40.6	345.0	15.1
LSD	2.2	0.7	1.2	0.0	2.6	11.3	0.5	0.3	0.7	18.7	0.2
Pr>F	0.0001	0.2029	0.0001	1.0000	0.0001	0.5910	0.1124	0.0010	0.0001	0.0001	0.0001

Table 4. Effect of copper and lorsban inputs on agronomic performance of spring wheat. 2013

					CAP 400-1						
Check	1.7	185	39.4	0.0	0.0	87.8	15.4	61.9	35.2	439.5	14.4
Copper	5.7	185	38.3	0.0	0.0	84.2	15.4	62.0	35.1	450.0	14.5
Lorsban	1.7	185	40.4	0.0	0.0	99.4	15.4	62.3	35.7	460.1	14.3
Copper & Lorsban	3.3	185	38.9	0.0	0.0	92.1	15.0	62.2	35.5	452.2	14.3
					Solano						
Check	7.3	185	29.5	0.0	11.2	87.8	15.1	61.1	40.7	335.1	15.0
Copper	9.0	185	28.8	0.0	11.8	90.6	14.9	61.4	40.9	354.6	15.0
Lorsban	9.0	185	30.3	0.0	7.3	105.8	15.0	61.8	40.9	346.1	15.1
Copper & Lorsban	13.3	184	30.2	0.0	11.4	90.2	14.4	61.8	40.1	344.0	15.3
LSD	4.4	1.4	2.5	0.0	5.3	22.6	1.1	0.5	1.4	37.5	0.4
Pr>F	0.1659	0.5820	0.8008	1.0000	0.5127	0.8993	0.9728	0.5907	0.5368	0.8719	0.3871

SR: stripe rust, HD: heading, HT: height, LOD: lodging, OWBM: orange wheat blossom midge, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number, MC: moisture

Project Title:	Effect of Genetic Resistance and Insecticide Application on Orange Wheat Blossom Midge (OWBM) control – 2013
Project Leader:	Bob Stougaard
Project Personnel:	Brooke Bohannon, Luther Talbert, and Nancy Blake
Objective:	To evaluate the interactive effects of spring wheat genetic resistance and insecticide application on orange wheat blossom midge control.

Results:

Sixteen spring wheat cultivars were screened for OWBM control. Nine of the cultivars were experimental lines containing the Sm1 gene for resistance (CAP). Four of the cultivars were experimental lines derived from crosses between Hank and Reeder (MQTL). Solano, Hank, and Reeder are three commercially available varieties also included in the study. The experiment was a split plot design. One set of sixteen cultivars were treated with Lorsban, and the second set was left untreated.

Overall midge pressure was low this year in comparison to previous years. The average number of owbm was only about 4 per spike. Nevertheless, the Sm1 gene was very efficacious and lines with this trait performed better than lines without it. While the Sm1 gene resulted in almost complete insect mortality, the effect of the insecticide treatment was still apparent. Grain yields increased when plots were treated with Lorsban, regardless of the cultivar. The average yield increase for Reeder, Hank, and Solano was 12.8 bu/A. Likewise, the average yield increase for the MQTL lines was 17 bu/A. This illustrates that low midge populations can have a negative impact on yield. However, even the CAP lines benefited from the insecticide application. For example, untreated CAP400-1 was devoid of midge larvae and produced 90 bu/A, but the same germplasm produced 99 bu/A when treated with Lorsban. Average over all CAP lines, yields increased by 6.6 bu/A when treated with the insecticide. This indicates that the young larvae manage to cause significant damage to the wheat seed before the Sm1 gene can elicit its lethal effect.

Summary:

Cultivars treated with Lorsban produce better yields and test weights, and may contribute to higher falling numbers.

Table 1. Materials and Methods - Genetic and insecticide OWBM control- 2013

Seeding Date:	5/6/13	Fertilizer:	150-40-110-20
Julian Date:	126	Herbicide:	5/31/13
Seeding Rate:	80 lb/A		Affinity TankMix 0.6 OZ/A, MCPE 0.5 PT/A, Axial 16.4 FL OZ/A
Previous Crop:	Canola		
Tillage:	Conventional		
Irrigation:	None	Harvest Date:	9/4/13
Soil Type:	Creston Sil	Julian Date:	247
Soil Test:	136-10-100		

Table 2. Effect of genetic resistance and insecticide application on OWBM control – 2013

Treatment	SR %	HD Julian	HT in	LOD %	OWBM no/spk	YLD bu/A	PRO %	TWT lb/bu	TKW g	FN sec
Treated										
CAP 34-1	36.7	182	33.7	0.0	0.0	88.4	13.4	61.4	32.9	324.8
CAP 84-1	35.0	181	37.0	0.0	0.0	80.4	14.6	60.9	33.2	353.0
CAP 84-2	31.7	180	34.5	0.0	0.0	82.3	14.3	61.0	34.4	347.3
CAP 108-3	20.0	182	34.1	0.0	0.0	94.8	14.4	61.4	35.9	349.3
CAP 151-3	18.3	180	31.6	0.0	0.0	87.3	15.0	62.2	32.5	380.0
CAP 197-3	25.0	183	38.3	3.3	0.0	88.7	13.6	60.1	31.6	333.7
CAP 201-2	26.7	181	36.6	0.0	0.0	84.6	14.6	61.2	33.1	317.1
CAP 219-3	40.0	181	35.3	0.0	0.3	82.9	13.8	61.3	33.1	337.3
CAP 400-1	5.0	182	37.5	0.0	0.0	99.2	17.0	61.4	34.6	420.5
MQTL 1075	21.7	182	36.5	15.0	4.0	86.4	16.0	60.1	39.4	332.0
MQTL 1076	16.7	183	37.7	55.0	4.3	88.2	16.1	59.8	36.4	365.5
MQTL 3042	28.3	181	38.1	0.3	3.0	94.2	14.3	61.6	38.5	353.9
MQTL 3043	30.0	181	37.3	0.0	4.7	89.9	15.2	61.7	37.9	355.0
REEDER	7.3	182	39.3	0.0	0.3	87.0	15.0	61.6	36.7	368.9
HANK	48.3	180	33.6	0.0	5.7	75.7	13.4	58.9	39.4	272.8
SOLANO	7.3	184	31.0	0.0	4.0	97.1	15.9	61.3	39.7	311.7
Nontreated										
CAP 34-1	40.0	182	33.0	0.0	0.0	81.7	13.5	60.5	32.4	335.9
CAP 84-1	40.0	181	36.2	0.0	0.0	73.3	14.8	60.1	32.2	347.9
CAP 84-2	30.0	181	36.1	0.0	0.3	71.4	14.8	60.5	32.5	347.6
CAP 108-3	25.0	182	35.0	0.0	0.0	86.4	14.9	60.6	34.0	357.2
CAP 151-3	23.3	180	32.3	0.0	0.0	77.4	15.4	61.5	31.2	362.2
CAP 197-3	20.0	184	38.1	4.3	0.0	87.8	13.7	60.0	30.6	328.7
CAP 201-2	26.7	182	36.9	0.0	0.0	83.3	14.9	60.4	31.9	321.5
CAP 219-3	35.0	181	35.6	0.0	0.0	76.7	14.0	60.3	31.7	318.8
CAP 400-1	4.3	184	37.3	0.0	0.0	90.8	16.9	60.8	33.8	408.0
MQTL 1075	21.0	183	35.3	1.7	13.0	66.7	16.6	58.9	39.1	294.5
MQTL 1076	16.0	184	38.9	50.0	7.7	78.5	16.3	59.2	34.9	365.5
MQTL 3042	33.3	181	37.5	0.0	11.0	74.3	15.3	60.5	38.9	347.7
MQTL 3043	26.7	181	37.4	0.0	9.7	69.9	16.3	60.5	38.4	317.8
REEDER	11.7	182	39.0	0.0	7.0	79.2	15.7	61.1	37.4	347.8
HANK	83.3	180	33.6	0.0	27.0	59.1	14.7	57.7	39.1	272.4
SOLANO	5.0	184	31.6	0.0	18.3	83.0	16.5	60.1	38.8	310.8
Mean	26.2	181.8	35.8	4.1	3.8	82.7	15.0	60.6	35.2	340.9
CV	33.2	0.4	3.9	140.1	74.4	5.7	1.4	0.6	1.9	3.6
LSD	14.2	1.1	2.3	9.3	4.6	7.7	0.3	0.6	1.1	20.0
Pr>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

SR: stripe rust, HD: heading HT: height, LOD: lodging, OWBM: orange wheat blossom midge, YLD: Yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number

Project Title: Orange Wheat Blossom Midge (OWBM) Response to Spring Wheat Varieties and Insecticides – 2013

Project Leader: Bob Stougaard

Project Personnel: Brooke Bohannon

Objective: To evaluate insecticide efficacy when applied to spring wheat varieties differing in susceptibility to OWBM.

Results:

The factorial treatment arrangement consisted of three insecticide treatments and eight spring wheat varieties that varied in attractiveness/susceptibility to the orange wheat blossom midge. The spring wheat varieties consisted of Brennan, Hank, Kuntz, McNeal, Reeder, Treasure, MT0802 and MT1073. The insecticide treatments included Lorsban, Warrior, and a non-treated control. The study was planted on May 6, and individual plots consisted of seven, 6-inch rows, 15 feet in length, with each variety-insecticide combination replicated 3 times in a split plot design. Warrior and Lorsban were applied on July 2 at 1.9 oz/A, and 1 pt/A, respectively. Treatments were applied with a backpack sprayer in 20 GPA of water. The fungicide Headline was applied at 9 oz/A on June 21 to control stripe rust.

Midge numbers were modest and averaged only 5.3 larvae per spike, yet significant yield differences were observed for the main effect of insecticide treatments (Table 2). Averaged over the eight varieties, yields for the non-treated check were 86 bu/A, whereas the average yield for the Lorsban and Warrior applications was 98 bu/A. This increase of 12 bu/A is impressive, if not disconcerting, considering the low midge population present and illustrates just how damaging this pest can be.

Differences in OWBM levels also were detected among varieties (Table 3). MT0802 and Hank had the highest infestations while MT1073 and Treasure had the lowest numbers. Nonetheless, cultivar attractiveness did not impact insecticide efficacy (Table 4). In summary, low midge pressures did not affect insecticide performance, but did impact yields.

Table 1. Materials and Methods -Spring wheat insecticide - 2013

Seeding Date:	5/6/13	Fertilizer:	150-40-110-20
Julian Date:	126	Herbicide:	5/31/13
Seeding Rate:	80 lb/A		Affinity TankMix 0.6 OZ/A, MCPE
Previous Crop:	Canola		0.5 PT/A, Axial 16.4 FL OZ/A
Tillage:	Conventional	Fungicide:	6/21/13
Irrigation:	None		Headline 9 FL OZ/A
Soil Type:	Creston Sil	Harvest Date:	9/4/13
Soil Test:	136-10-100	Julian Date:	247

Table 2. Main effect of insecticide treatment on management of OWBM in spring wheat – 2013

Treatment	HD Julian	HT in	LOD %	SR %	OWBM no/spk	YLD bu/A	PRO %	TWT lb/bu	TKW g	MC %	FN sec	AA units/g
Check	184	35.1	0.0	17.2	10.9	85.9	14.6	60.6	37.8	13.6	358.3	0.05
Lorsban	183	35.0	0.0	11.8	3.4	98.1	14.3	61.1	37.7	13.7	376.1	0.05
Warrior	183	34.8	4.7	21.8	1.7	98.0	14.2	61.3	38.3	13.8	363.3	0.05
Mean	183.3	34.9	1.6	16.9	5.3	94.0	14.3	61.0	38.0	13.7	365.9	0.05
LSD	0.9	1.2	9.2	3.7	2.6	7.1	0.8	0.4	1.3	0.1	32.3	0.00
Pr>F	0.2043	0.7854	0.3623	0.0045	0.0012	0.0138	0.4833	0.0198	0.4499	0.0128	0.3802	0.4667

Table 3. Agronomic performance of spring wheat cultivars on management of OWBM – 2013

Cultivar	HD Julian	HT in	LOD %	SR %	OWBM no/spk	YLD bu/A	PRO %	TWT lb/bu	TKW g	MC %	FN sec	AA units/g
Brennan	182	29.9	0.0	6.0	4.3	77.7	15.6	61.4	35.5	13.5	297.7	0.07
Hank	181	33.2	0.0	46.4	10.7	88.4	14.0	59.1	42.8	13.5	295.5	0.06
Kuntz	184	33.0	0.0	6.6	6.9	95.0	14.0	62.3	33.7	13.9	412.8	0.06
McNeal	184	37.0	0.0	25.6	6.9	84.5	14.9	60.7	36.9	13.4	483.8	0.04
Reeder	183	38.8	1.3	7.8	2.3	97.9	15.1	61.6	38.1	13.6	400.2	0.05
Treasure	188	34.7	7.2	22.7	0.9	109.5	11.0	59.8	36.1	14.2	303.8	0.05
MT0802	185	37.9	0.0	18.3	8.6	95.8	15.3	60.6	42.4	13.4	358.1	0.06
MT1073	181	34.9	3.9	2.2	1.9	103.4	14.6	62.5	38.2	13.9	375.0	0.04
Mean	183.3	34.9	1.6	16.9	5.3	94.0	14.3	61.0	38.0	13.7	365.9	0.05
LSD	0.7	1.3	7.9	9.1	2.9	7.3	0.4	0.5	1.8	0.3	20.0	0.01
Pr>F	0.0001	0.0001	0.4967	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

HD: heading, HT: height, LOD: lodging, SR: stripe rust, OWBM: orange wheat blossom midge, YLD: Yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, MC: moisture content, FN: falling number, AA: alpha amylase

Table 4. Spring wheat response to the effects of insecticide and varieity on the management of OWBM – 2013

Cultivar	HD Julian	HT in	LOD %	SR %	OWBM no/spk	YLD bu/A	PRO %	TWT lb/bu	TKW g	MC %	FN sec	AA units/g
						Check						
Brennan	182	31.4	0.0	6.3	8.3	66.4	15.8	60.6	34.2	13.4	272.1	0.07
Hank	181	32.0	0.0	46.0	26.3	73.2	14.6	58.5	43.9	13.4	291.1	0.06
Kuntz	184	34.0	0.0	8.0	11.9	90.5	14.4	62.2	34.3	13.9	404.9	0.06
McNeal	185	37.1	0.0	25.0	9.5	75.5	15.2	60.1	36.5	13.3	491.3	0.04
Reeder	183	38.1	0.0	10.7	5.2	93.0	15.3	61.3	37.7	13.4	396.2	0.05
Treasure	188	34.7	0.0	20.0	1.1	104.6	11.0	59.8	36.0	14.2	308.6	0.04
MT0802	186	38.2	0.0	18.3	20.3	85.9	15.6	60.1	41.7	13.3	338.4	0.07
MT1073	181	35.1	0.0	3.3	4.5	98.3	14.6	62.0	38.2	13.7	363.7	0.04
						Warrior						
Brennan	181	28.8	0.0	4.0	2.0	87.8	15.6	61.7	36.8	13.4	291.1	0.06
Hank	181	33.7	0.0	71.7	3.6	95.3	13.7	59.2	42.2	13.6	286.2	0.06
Kuntz	184	31.2	0.0	7.3	3.5	92.4	13.9	62.6	34.1	14.0	421.6	0.06
McNeal	184	36.7	0.0	30.0	2.7	90.1	14.7	61.4	38.0	13.6	459.6	0.04
Reeder	182	39.5	4.0	8.3	0.1	104.5	15.1	61.9	38.4	13.7	403.2	0.05
Treasure	188	35.2	21.7	31.7	0.0	107.6	11.1	59.7	35.6	14.3	288.8	0.05
MT0802	185	38.2	0.0	20.0	1.2	102.3	15.0	61.1	43.0	13.6	379.6	0.07
MT1073	181	34.6	11.7	1.3	0.3	104.3	14.6	62.8	38.6	14.1	376.0	0.04
						Lorsban						
Brennan	181	29.5	0.0	7.7	2.6	78.9	15.4	61.8	35.4	13.6	329.7	0.07
Hank	180	33.8	0.0	21.7	2.3	96.6	13.8	59.5	42.3	13.6	309.2	0.05
Kuntz	183	33.9	0.0	4.3	5.2	102.2	13.6	62.2	32.7	13.9	412.0	0.06
McNeal	184	37.0	0.0	21.7	8.5	88.0	15.0	60.7	36.0	13.3	500.6	0.04
Reeder	183	38.7	0.0	4.3	1.6	96.4	15.1	61.5	38.2	13.7	401.3	0.05
Treasure	187	34.3	0.0	16.3	1.7	116.3	11.1	59.9	36.8	14.2	313.9	0.05
MT0802	184	37.4	0.0	16.7	4.2	99.2	15.3	60.7	42.5	13.4	356.4	0.06
MT1073	181	35.0	0.0	2.0	0.9	107.6	14.7	62.6	37.9	13.9	385.3	0.04
Mean	183.3	34.9	1.6	16.9	5.3	94.0	14.3	61.0	38.0	13.7	365.9	0.05
LSD	1.2	2.3	13.7	15.8	5.1	12.7	0.6	0.8	3.1	0.4	34.7	0.01
Pr>F	0.6554	0.2023	0.5400	0.0119	0.0001	0.3175	0.5139	0.4408	0.8662	0.9754	0.1355	0.9940

HD: heading, HT: height, LOD: lodging, SR: stripe rust, OWBM: orange wheat blossom midge, YLD: Yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, MC: moisture content, FN: falling number, AA: alpha amylase

Project Title: On-Farm Comparison of Varietal Preference to Egg-laying by Orange Wheat Blossom Midge.

Project Leader: Bob Stougaard

Project Personnel: Brooke Bohannon, Heritage Custom Farming, John Josephsen, Miles Passmore, Jordan Penney, David Tutvedt

Objective: To compare the attractiveness of two commercially available spring wheat varieties for egg-laying preference by the OWBM.

Results:

Previous studies conducted at NWARC have demonstrated that certain spring wheat varieties attract the adult egg-laying midge, while other varieties deter egg-laying. To test this apparent preference trend under a field scale basis, Reeder (non-attractive) and Solano (attractive), were planted at five on-farm locations in Flathead County. Field size ranged from 5 to 16 acres per variety. The locations selected had a previous history of substantial OWBM pressure.

Fields were seeded at 100 lb/A (Reeder) and 135 lb/A (Solano) to achieve a target population of 35 plants per square foot. Planting was delayed until approximately May 1, to insure that heading coincided with peak oviposition (Table 1).

Reeder, a taller variety and therefore prone to lodging, was treated with Palisade, a plant growth regulator, at the 2 node stage to all fields except the Passmore site. The insecticide, Warrior II, was applied at each location when OWBM populations reached economic threshold levels (Table 1).

Despite high OWBM numbers observed at all locations (Table 1), there were no significant differences in the number of larvae found per spike (Table 2). Significant differences were observed in plant height with Reeder being on average was 5 inches taller than Solano.

On average, Solano produced 14 bu/A more grain than Reeder. However, yields were confounded by hail damage at three of the five locations. In small nursery plot situations, Reeder usually has far fewer midge larvae than Solano. This in turn translates to higher yields and better quality for Reeder. Either the application of an insecticide negated this advantage, or perhaps this ovipositioning dynamic does not hold when the varieties are grown on a large scale basis. Differential hail damage between varieties further complicates the results. Overall, it seems beneficial to scale-up experiments in an attempt to substantiate preliminary findings.

Table 1.

Location	Seeding	Harvest	Palisade	Insecticide	OWBM #/ trap	OWBM Date
HCF	5/6	8/22	6/22	7/6	660	6/24-6/27
NWARC	5/9	9/12	6/21	7/9	1010	6/29-7/1
Passmore	5/1	8/25	–	7/5	161	6/27-7/1
Tutvedt	4/27	9/4	6/19	7/5	1115	7/2-7/4

Table 2. Agronomic data from the on-farm comparison of varietal preference to egg-laying by OWBM - 2013

	Plant Density #/sqft		Height inches		OWBM no/spike		Yield bu/A	
Location	Reeder	Solano	Reeder	Solano	Reeder	Solano	Reeder	Solano
HCF	25	26	28	27	4	7	42	41
NWARC R13	32	23	36	33	5	1	70	100
NWARC Y7	40	30	38	33	6	12	73	85
Passmore	26	28	38	31	1	3	69	88
Tutvedt	19	34	36	28	0	0	97	107
Mean	28	28	35	30	3	5	70	84
CV	25.3		6.2		67.4		10.5	
LSD	12.6		3.6		4.6		14.2	
Pr>F	0.9669		0.0200		0.4466		0.0524	

OWBM: orange wheat blossom midge

Table 2. continued

	Protein %		FNa seconds		FNb seconds		TWT lb/bu	
Location	Reeder	Solano	Reeder	Solano	Reeder	Solano	Reeder	Solano
HCF	17.4	16.7	386	375	451	387	56	54
NWARC R13	14.8	15.3	385	355	353	391	59	60
NWARC Y7	15.7	15.4	345	334	425	356	59	60
Passmore	14.6	15.3	331	401	394	460	62	61
Tutvedt	14.9	14.2	369	354	417	367	60	60
Mean	15.5	15.4	363.2	364	408	392	59	59
CV	3.0		7.6		11.1		1.7	
LSD	0.8		49.1		78.3		1.8	
Pr>F	0.7530		0.9746		0.6052		0.6051	

FNa: falling numbers performed at NWARC, FNb; falling numbers perfromed at the National Quality Inspection Lab, TWT: test weight

Project Title: Sm1 Interspersed Refuge Evaluation -2013

Project Leader: Bob Stougaard

Project Personnel: Brooke Bohannon, Luther Talbert, and Nancy Blake

Objective: To evaluate the efficacy and agronomic performance of the interspersed refuge system.

Results:

The purpose of the interspersed refuge system is to delay the selection of virulent, Sm1 resistant, midge populations. The refuge, or susceptible variety, is blended with the midge resistant variety at a ratio of 1:10. The combination is then planted together in an effort to maintain the genetic diversity of the midge population.

In this study, CAP 34-1 and CAP 400-1 contain the Sm1 gene for OWBM resistance, while Solano and Choteau are midge susceptible varieties. These four cultivars were planted alone and as blends (Table 2), where the CAP lines comprise 90% of the blended mixtures.

Despite modest midge pressure during heading, differences were detected among varieties. The non-resistant varieties, Solano and Choteau, had significantly higher number of larvae compared to the Sm1 resistant CAP lines. The CAP lines, alone or blended, resulted in 86% to 100% midge mortality. The blend of CAP 400-1 & Choteau resulted in a 19.1 bu/A increase over Choteau. These results demonstrate that the interspersed refuge can allow a low number of owbm to reproduce without sacrificing grain yield.

Table 1. Materials and Methods - Sm1 interspersed refuge system - 2013.

Seeding Date:	5/6/13	Fertilizer:	150-40-110-20
Julian Date:	126	Herbicide:	5/31/13
Seeding Rate:	80 lb/A		Affinity TankMix 0.6 OZ/A, MCPE
Previous Crop:	Barley		0.5 PT/A, Axial 16.4 FL OZ/A
Tillage:	Conventional	Fungicide:	6/21/13
Irrigation:	None		Headline 9 FL OZ/A
Soil Type:	Creston Sil	Harvest Date:	9/13/13
Soil Test:	162-14-142	Julian Date:	256

Table 2. Agronomic data for the efficacy of the Sm1 interspersed refuge system - 2013.

Treatment	HD Julian	SR %	HT in	LOD %	YLD bu/A	PRO %	TWT %	OWBM no/spk	TKW g	MC %
SOLANO	184	2.3	31.8	0.0	84.2	15.2	58.9	11.9	37.9	13.2
CHOTEAU	182	4.0	37.3	0.0	73.5	15.5	58.5	13.4	34.0	13.3
CAP 34-1	182	5.0	35.8	0.0	88.6	13.1	59.9	0.0	33.2	14.0
CAP 400-1	184	0.0	38.5	0.0	95.8	15.5	60.1	0.0	32.9	13.8
CAP 34-1 & SOLANO	182	4.3	35.7	0.0	90.0	13.4	59.9	0.0	34.2	13.9
CAP 34-1 & CHOTEAU	182	4.0	36.0	0.0	88.2	13.4	59.9	1.8	34.1	14.0
CAP 400-1 & SOLANO	183	0.0	38.1	0.0	91.5	15.6	60.0	0.0	32.2	13.8
CAP 400-1 & CHOTEAU	183	0.7	38.5	0.0	92.6	16.1	59.7	0.0	32.8	13.7
Mean	182.7	2.5	36.4	0.0	88.0	14.7	59.6	3.4	33.9	13.7
CV	0.2	72.4	2.3	0.0	5.6	4.4	0.6	94.8	3.3	0.9
LSD	0.6	3.2	1.5	0.0	8.7	1.1	0.6	5.6	1.9	0.2
Pr>F	0.0001	0.0162	0.0001	1.0000	0.0030	0.0001	0.0006	0.0002	0.0007	0.0001

HD: heading, SR: stripe rust, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight, OWBM: orange wheat blossom midge, TKW: thousand kernel weight, MC: moisture

Project Title:	Spring Wheat Cultivar Response to Insecticide and Fungicide Applications -2013.
Project Leader:	Bob Stougaard
Project personnel:	Brooke Bohannon and Luther Talbert
Objective:	To determine the response of commercial spring wheat varieties to fungicide and insecticide inputs.

Results:

Stripe rust and the orange wheat blossom midge (OWBM) are two troublesome pests in spring wheat. This study was conducted to determine the level of plant resistance present in common spring wheat varieties, and to determine the agronomic response of these materials when treated for the control of these two pests. Twenty four spring wheat varieties were grown and were either treated or not treated with appropriate pesticides. Headline was applied for the control of stripe rust, while lorsban was applied for the control of OWBM.

Stripe rust pressure was substantial and the effects of this disease had a negative impact on the growth and yield of most spring wheat varieties. Stripe rust infection averaged 31% in the check varieties, ranging from a low of 0% for Volt to a high of 95% for AP604CL (Table 2). Treatment with Headline reduced stripe rust infection to an average of 3.6%, with the highest levels of infection being observed for Hank and AP604CL, at 8.7 and 8%, respectively.

Stripe rust infection negatively affected spring wheat growth and development, resulting in a reduction in plant height. Check varieties averaged 36.3 inches, while treated plants averaged 37.5 inches in height. The taller plant height partially contributed to a higher incidence of lodging. The check varieties averaged 1.3% lodging, while treated plants averaged 10.4% lodging. The increased lodging also was partially attributed to heavier wheat spikes and greater yields. That is, there was a strong relationship between stripe rust infection and spring wheat yield (Figure 1).

Table 1. Materials and Methods - Spring wheat off station - 2013

Seeding Date:	5/6/13	Fertilizer:	150-40-110-20
Julian Date:	126	Herbicide:	5/31/13
Seeding Rate:	80 lb/A		Affinity TankMix 0.6 OZ/A, MCPE
Previous Crop:	Canola		0.5 PT/A, Axial 16.4 FL OZ/A
Tillage:	Conventional	Fungicide:	6/21/2013 Headline 9 FL OZ/A
Irrigation:	None	Insecticide:	7/2/2013 Lorsban 1 PT/A
Soil Type:	Creston Sil	Harvest Date:	9/6/13
Soil Test:	136-10-100	Julian Date:	249

Figure 1. Effect of stripe rust on wheat yield.

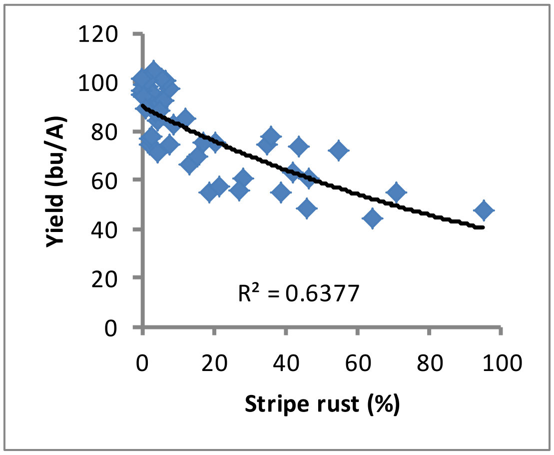
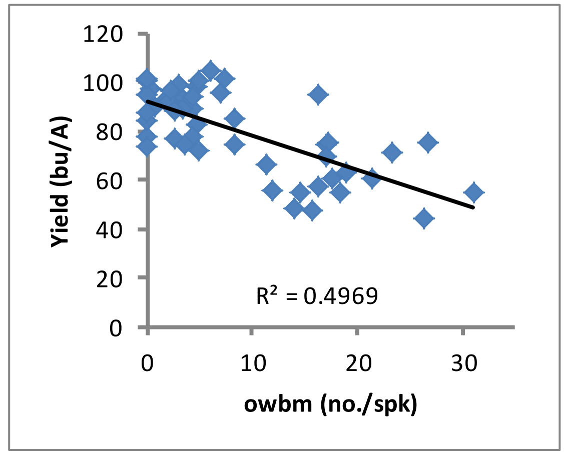


Figure 2. Effect of OWBM on wheat yield.



Although stripe rust negatively affected wheat yields, OWBM damage also contributed to a reduction in yields (Figure 2). OWBM pressures were moderate, averaging 15 larvae per spike (Table 3). The highest numbers were recorded for Hank at 31 larvae per spike, while several of the CAP lines had no larvae. Lorsban effectively control OWBM, reducing densities to an average of 3 larvae per spike.

The combine effect of both pests negatively affected yields. The check varieties averaged 66 bu/A while the treated varieties averaged 92 bu/A. Pesticide treatments improved the yield of every variety evaluated, but the magnitude of the yield response varied depending on the susceptible of each variety to the pest complex present. In general, the more susceptible the variety, the greater the yield benefit. Choteau, AP 604CL, and Oneal benefited the most from the treatments, with percent yield increases of 117,102 and 69 percent. In contrast, yields for Volt, Reeder, and CAP 400-1 increased by 7, 11, and 13 percent, respectively.

Regardless of being treated or not, Volt, CAP 197-3 and MT 1142 consistently ranked as high yielding varieties. Likewise, Hank, and Oneal consistently ranked as low yielding varieties. Treated varieties generally had lower protein, as well as higher test weights and falling numbers. Nevertheless, CAP 400-1 had some of the highest protein contents and highest falling number values.

Summary:

The relative ranking of spring wheat varieties changed depending on whether or not they had been treated for stripe rust and the orange wheat blossom midge. However, several varieties consistently yielded well, irrespective of treatment.

Table 2. Agronomic response of spring wheat varieties to fungicide and insecticide inputs. Kalispell, 2013.

	Heading (Julian)			Height (in)			Lodging (%)			Stripe rust (%)		
Cultivar	check	treated	avg	check	treated	avg	check	treated	avg	check	treated	avg
AP604CL	180	180	180	37.7	40.0	38.9	0.0	1.0	0.5	95.3	8.0	51.7
Brennan	181	181	181	30.2	32.3	31.3	0.0	0.0	0.0	34.7	5.7	20.2
BuckPronto	180	180	180	35.8	37.4	36.6	0.0	0.0	0.0	13.3	4.3	8.8
CAP 197-3	183	184	184	38.1	39.1	38.6	6.7	26.7	16.7	36.0	6.7	21.3
CAP 34-1	182	182	182	33.6	35.4	34.5	0.0	0.7	0.3	54.7	4.0	29.3
CAP 400-1	184	184	184	39.2	38.7	39.0	0.0	0.0	0.0	4.7	0.0	2.3
CAP 219-3	181	181	181	36.3	38.3	37.3	0.0	10.0	5.0	44.0	5.7	24.8
Choteau	183	182	183	35.0	37.3	36.2	0.0	0.0	0.0	46.0	3.3	24.7
Corbin	181	181	181	35.5	35.9	35.7	1.7	58.3	30.0	28.3	4.3	16.3
Duclair	181	182	181	37.3	37.1	37.2	0.3	15.7	8.0	27.3	4.0	15.7
Fortuna	183	182	183	46.7	46.1	46.4	22.7	48.3	35.5	18.7	2.3	10.5
Hank	180	180	180	31.9	32.8	32.4	0.0	0.0	0.0	71.0	8.7	39.8
Jefferson	181	182	182	37.4	36.7	37.1	0.0	0.0	0.0	20.3	1.7	11.0
Kelby	180	180	180	30.8	31.0	30.9	0.0	0.0	0.0	39.0	6.0	22.5
McNeal	184	185	184	38.3	38.9	38.6	0.0	0.0	0.0	21.7	2.7	12.2
MT 1053	183	183	183	35.3	36.3	35.8	0.0	0.0	0.0	42.3	2.7	22.5
MT 1142	182	183	182	39.8	41.6	40.7	0.0	30.0	15.0	17.3	0.7	9.0
MT 1172	183	183	183	37.2	38.5	37.8	0.0	34.0	17.0	2.3	0.0	1.2
Oneal	184	184	184	36.3	37.9	37.1	0.0	0.0	0.0	64.3	7.7	36.0
Reeder	182	182	182	39.5	41.2	40.4	0.0	24.0	12.0	12.3	0.7	6.5
Solano	183	184	183	29.0	31.0	30.0	0.0	0.0	0.0	4.7	1.7	3.2
Vida	184	183	183	37.9	40.9	39.4	0.0	1.3	0.7	15.3	1.3	8.3
Volt	188	188	188	37.3	37.7	37.5	0.0	0.0	0.0	0.0	0.0	0.0
WB9879CLP	182	183	183	36.1	38.1	37.1	0.0	0.0	0.0	46.7	5.0	25.8
Mean	182	182	182	36.3	**37.5**	36.9	1.3	**10.4**	5.9	31.7	**3.6**	17.7
LSD	NS		0.85	NS		1.76	17.77		12.57	8.21		5.81
Pr>F	0.6809		0.0001	0.8560		0.0001	0.0002		0.0001	0.0001		0.0001

Table 3. Agronomic response of spring wheat varieties to fungicide and insecticide inputs. Kalispell, 2013.

	owbm (no/spk)			Yield (bu/A)			Protein (%)			Test weight (lb/bu)		
Cultivar	check	treated	avg	check	treated	avg	check	treated	avg	check	treated	avg
AP604CL	15.7	0.3	8.0	47.9	97.0	72.5	14.1	14.9	14.5	60.6	62.7	61.7
Brennan	17.0	1.7	9.3	74.4	92.6	83.5	15.6	14.9	15.3	60.7	62.4	61.5
BuckPronto	11.3	0.7	6.0	66.5	89.9	78.2	16.6	15.1	15.9	60.3	60.5	60.4
CAP 197-3	0.0	0.0	0.0	78.0	100.7	89.4	13.7	13.5	13.6	59.9	60.7	60.3
CAP 34-1	5.0	0.0	2.5	72.2	87.6	79.9	13.8	13.9	13.9	60.6	61.3	61.0
CAP 400-1	0.0	0.0	0.0	84.4	95.3	89.9	16.3	16.1	16.2	61.1	61.6	61.3
CAP 219-3	0.0	0.0	0.0	73.7	101.5	87.6	14.1	14.3	14.2	60.3	60.9	60.6
Choteau	14.0	6.0	10.0	48.3	105.1	76.7	15.6	15.0	15.3	59.0	60.8	59.9
Corbin	21.3	4.3	12.8	60.8	89.0	74.9	15.7	14.4	15.1	60.7	62.0	61.3
Duclair	12.0	3.3	7.7	55.3	93.0	74.2	16.2	14.2	15.2	58.4	60.4	59.4
Fortuna	14.7	2.7	8.7	55.1	77.3	66.2	15.7	15.4	15.6	59.3	61.5	60.4
Hank	31.0	4.7	17.8	54.5	82.5	68.5	14.9	13.8	14.4	57.0	58.7	57.9
Jefferson	26.7	4.7	15.7	75.6	97.8	86.7	15.2	14.3	14.8	61.6	61.2	61.4
Kelby	18.3	2.0	10.2	54.6	92.1	73.4	16.0	15.4	15.7	59.7	61.7	60.7
McNeal	16.3	4.3	10.3	57.7	78.1	67.9	15.6	14.7	15.2	59.5	61.1	60.3
MT 1053	19.0	7.0	13.0	62.8	95.8	79.3	15.0	13.7	14.4	59.0	61.3	60.2
MT 1142	17.3	3.0	10.2	75.3	98.7	87.0	16.1	15.1	15.6	61.5	62.1	61.8
MT 1172	8.3	2.3	5.3	74.6	96.3	85.5	16.2	15.1	15.7	57.8	59.4	58.6
Oneal	26.3	3.7	15.0	44.0	74.3	59.2	15.2	14.4	14.8	57.8	60.0	58.9
Reeder	8.3	4.3	6.3	84.9	94.4	89.7	15.1	15.1	15.1	61.4	61.4	61.4
Solano	23.3	5.0	14.2	71.6	100.6	86.1	16.3	14.9	15.6	59.7	61.5	60.6
Vida	17.0	3.3	10.2	69.6	89.5	79.6	15.9	14.6	15.3	59.5	60.8	60.1
Volt	16.3	7.3	11.8	94.6	101.4	98.0	14.3	14.2	14.3	62.2	62.5	62.3
WB9879CLP	17.7	2.7	10.2	60.5	88.5	74.5	15.8	14.7	15.3	58.0	61.0	59.5
Mean	14.9	**3.1**	9.0	66.5	**92.5**	79.5	15.4	**14.7**	15.0	59.8	**61.1**	60.5
LSD	9.53		6.74	15.4		10.9	0.63		0.45	1.02		0.72
Pr>F	0.0049		0.0001	0.0046		0.0001	0.0001		0.0001	0.0003		0.0001

Table 4. Effect of fungicide and insecticide inputs on grain quality. Kalispell, 2013.

	1000 Kernel weight (g)			Falling number (sec.)			Moisture (%)		
Cultivar	check	treated	avg	check	treated	avg	check	treated	avg
AP604CL	31.2	34.7	32.9	330.0	353.5	341.8	16.5	16.2	16.4
Brennan	35.4	35.1	35.3	248.2	397.1	322.7	15.8	15.6	15.7
BuckPronto	42.6	40.9	41.7	325.2	389.7	357.4	15.6	15.7	15.7
CAP 197-3	32.4	33.7	33.0	343.4	351.1	347.2	16.0	16.3	16.2
CAP 34-1	33.6	33.0	33.3	362.9	391.3	377.1	16.6	16.7	16.6
CAP 400-1	33.8	34.0	33.9	446.6	479.4	463.0	15.5	15.4	15.5
CAP 219-3	32.7	34.5	33.6	354.2	375.1	364.6	16.2	16.1	16.1
Choteau	35.4	34.7	35.1	368.7	419.4	394.0	16.2	16.1	16.2
Corbin	42.5	41.6	42.1	344.7	388.1	366.4	15.8	16.2	16.0
Duclair	38.7	37.0	37.9	294.9	378.7	336.8	16.3	16.1	16.2
Fortuna	39.8	42.7	41.3	302.6	321.9	312.3	16.6	16.0	16.3
Hank	38.5	39.9	39.2	237.2	352.5	294.8	15.7	15.7	15.7
Jefferson	41.1	37.3	39.2	334.1	384.4	359.2	15.5	15.3	15.4
Kelby	33.2	35.4	34.4	203.0	361.3	282.1	15.7	15.5	15.6
McNeal	35.4	35.7	35.6	453.4	506.9	480.2	15.5	15.1	15.3
MT 1053	38.6	40.0	39.3	262.1	346.6	304.4	16.6	16.7	16.6
MT 1142	37.6	39.6	38.6	358.4	363.6	361.0	16.3	15.8	16.1
MT 1172	39.6	38.9	39.3	303.4	357.8	330.6	15.9	16.0	16.0
Oneal	31.6	31.1	31.3	388.5	439.4	413.9	16.1	15.7	15.9
Reeder	37.2	37.8	37.5	388.9	429.8	409.3	15.6	15.7	15.6
Solano	40.8	38.9	39.9	315.4	383.5	349.4	15.4	15.5	15.5
Vida	37.2	38.0	37.6	278.4	320.5	299.5	15.9	16.2	16.1
Volt	36.2	31.8	34.0	393.0	425.0	409.0	16.3	16.6	16.4
WB9879CLP	33.9	32.9	33.4	377.5	427.1	402.3	16.0	16.2	16.1
Mean	36.6	36.6	36.6	334.0	**389.3**	361.6	16.0	15.9	16.0
LSD	NS		2.3	39.96		28.25	NS		0.39
Pr>F	0.1752		0.0001	0.0001		0.0001	0.6426		0.0001

Project Title:	Spring Wheat Seed Size Nursery – 2013
Project Leader:	Bob Stougaard
Project Personnel:	Brooke Bohannon
Objective:	To increase seed of select spring wheat varieties and to evaluate their agronomic performance in an environment representative of northwestern Montana.

Results:

Agronomic traits differed significantly among each of the sixteen spring wheat cultivars. Outlook had the highest yield at 78.7 bu/A, and Scholar had the lowest yield at 36.8 bu/A. Concurrently, Scholar had the highest stripe rust infection at 41.7 percent. Ideal A showed complete resistance to stripe rust, while all others showed some degree of susceptibility. Test weights ranged from 61.1 lb/bu for Agawam to 55.7 lb/bu for JC73. Percent protein ranged from 14.7% for JC73 to 12.3% for 1372. Outlook had the highest falling number at 459.8 seconds and JC73 had the lowest falling number at 205.0 seconds. Heading dates differed by 9 days, with Ideal A being the latest. Height ranged from 34.1 inches for Agawam to 55.2 inches for JC73. Most varieties were susceptible to lodging except Trenton. Ideal A experienced the most lodging at 88.3 percent. Thousand kernel weights ranged from 49.7 grams for 1372 to 30.4 grams for Explorer.

Table 1. Materials and Methods -Spring Wheat Seed Size - 2013

Seeding Date:	5/6/13	Fertilizer:	150-40-110-20
Julian Date:	126	Herbicide:	5/31/13
Seeding Rate:	80 lb/A		Affinity TankMix 0.6 OZ/A, MCPE
Previous Crop:	Barley		0.5 PT/A, Axial 16.4 FL OZ/A
Tillage:	Conventional	Insecticide:	7/2/13
Irrigation:	None		Lorsban 1 PT/A
Soil Type:	Creston Sil	Harvest Date:	9/13/13
Soil Test:	162-14-142	Julian Date:	256

Table 2. Spring wheat seed size effects on agronomic performance – 2013

Cultivar	SR %	HD Julian	HT in	LOD %	YLD bu/A	PRO %	TWT lb/bu	TKW g	FN sec
Outlook	2.3	184	39.0	1.7	78.7	14.0	58.6	37.1	459.8
Reeder	1.3	181	39.8	5.0	69.9	13.0	58.7	36.8	447.1
1372	15.0	183	39.2	43.3	69.7	12.3	57.4	49.7	367.8
Trenton	16.7	183	50.3	0.0	65.3	12.9	60.8	37.9	328.6
Agwam	13.3	180	34.1	6.7	60.7	13.7	61.1	47.8	349.4
WB926	6.7	180	34.8	3.3	59.5	13.7	58.0	40.2	386.8
Ernest	4.0	183	48.8	46.7	57.9	13.9	59.5	36.1	296.2
Choteau	4.7	182	36.2	10.0	57.3	13.9	59.1	34.5	394.4
Ideal A	0.0	189	53.0	88.3	56.1	14.4	58.7	47.8	312.6
MTHW0202	5.0	180	36.2	8.3	52.1	12.9	59.6	36.3	376.4
Fortuna	3.3	182	48.4	51.7	52.0	14.3	60.1	41.2	339.5
Explorer	15.0	182	35.7	35.0	50.3	14.1	57.3	30.4	405.2
JC73	4.0	186	55.2	68.3	48.8	14.7	55.7	47.2	205.0
Amidon	4.3	183	48.4	73.3	47.7	13.8	59.2	36.2	380.9
Thatcher	35.0	186	51.4	15.0	39.1	14.4	58.6	32.5	388.0
Scholar	41.7	184	46.1	61.7	36.8	14.6	59.5	35.2	365.7
Mean	10.8	182.9	43.5	32.4	56.4	13.8	58.9	39.2	–
CV	98.0	0.3	4.5	63.3	23.6	4.5	1.6	4.2	–
LSD	17.6	1.0	3.3	34.2	22.2	1.0	1.6	2.7	–
Pr>F	0.0007	0.0001	0.0001	0.0001	0.0408	0.0011	0.0001	0.0001	–

SR: stripe rust, HD: heading, HT: height, LOD: lodging, YLD: Yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number

Project Title: Evaluation of Advanced Spring Wheat Experimental Lines - 2013

Project Leader: Bob Stougaard

Project Personnel: Brooke Bohannon, Luther Talbert, and Nancy Blake

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

Results:

Heading dates spanned a 10 day period and averaged 176 Julian days (June 25). MT 1205 and MT 1203 were the earliest at 171 (June 20), with Thatcher and WB Mayville being the latest at 181 (June 30). Stripe rust was prevalent throughout the nursery and averaged 12 % despite being treated with a fungicide. MT 1252 and Jedd were the most susceptible varieties, while MT 1172, LCS Breakaway and CAP 400-1 had the lowest infection levels. Plant heights averaged 37 inches and ranged from 32 to 45 inches for Jedd and Thatcher, respectively. Not surprisingly, Thatcher also had a high incidence of lodging, as did MT 1205 and MT 1206. Yields averaged 106 bu/A, ranging from a high of 125 bu/A for Buckpronto to a low of 68 bu/A for Thatcher. Volt, along with several CAP lines, produced yields comparable to Buckpronto. Protein content averaged 15 %. The highest proteins were observed with SY605 CL (16.8%) and CAP400-1 (16.7%), while MT 1252 and LIMAGR5 had the lowest proteins at 13.3 % and 12.8%, respectively. Test weights averaged 61.5 lb/bu, ranging from a high of 64.1 lb/bu for WB Mayville, to a low of 59.2 lb/bu for MT 1224.

Summary:

Efforts to control stripe rust and orange wheat blossom midge allowed the genetic potential of the cultivars to be expressed. Yields were exceptional as were protein levels. Buckpronto and Volt continue to be the top yielding varieties for this area.

Table 1. Material and Methods - Spring wheat AYT - 2013

Seeding Date:	4/18/13	Fertilizer:	150-40-110-20
Julian Date:	108	Herbicide:	5/20/13
Seeding Rate:	80 lb/A		Affinity TankMix 0.6 OZ/A, MCPA
Previous Crop:	Alfalfa		0.5 PT/A, Axial 16.4 FL OZ/A
Tillage:	Conventional	Fungicide:	6/17/13 Headline 9 FL OZ/A
Irrigation:	None	Insecticide:	7/1/13 Warrior II 1.5 FL OZ/A
Soil Type:	Creston Sil	Harvest Date:	8/20/13
Soil Test:	130-12-144	Julian Date:	232

Table 2. Agronomic data from the evaluation of advanced spring wheat lines-2013

Cultivar	HD Julian	SR %	HT in	LOD %	YLD bu/A	PRO %	TWT lb/bu
Buckpronto	175	5.7	37.7	1.7	125.3	14.5	61.2
MTHW1150	178	18.0	40.3	0.0	124.1	14.4	61.7
Volt	178	1.7	34.7	0.0	123.8	14.6	63.8
MT 1236	175	4.7	34.4	1.7	123.0	16.0	61.2
MT 1255	172	15.7	35.3	0.0	122.1	14.4	60.9
MT 1231	175	6.0	36.1	0.7	121.2	15.5	61.9
CAP 34-1	175	7.7	35.3	0.7	120.5	14.3	62.3
MT 1142	176	11.7	39.9	13.3	118.1	16.0	62.5
MT 1133	176	4.3	35.7	0.0	117.8	15.1	61.8
CAP219-3	172	11.7	40.1	0.0	117.7	14.3	63.1
CAP197-3	177	15.0	36.2	0.0	116.5	13.9	61.0
MT 1103	178	12.7	37.3	16.7	116.3	14.9	62.3
MT 1219	177	5.7	33.7	81.7	115.1	15.1	61.3
MT 1227	178	4.3	37.3	6.7	114.2	16.2	59.7
Duclair	173	11.0	35.7	5.0	114.1	14.6	61.1
CAP400-1	179	1.0	38.1	0.0	113.4	16.7	61.8
MT 1230	178	3.0	38.3	1.7	113.3	16.1	60.9
Vantage	175	3.3	36.3	0.0	112.4	15.1	62.4
WB9879CL	176	8.3	36.2	0.0	111.8	15.1	61.6
WB Mayville	181	8.3	39.1	0.0	111.4	16.2	64.1
MT 1002	177	17.0	37.4	28.3	111.3	15.2	61.4
MT 1206	177	6.7	35.9	83.3	111.0	14.7	61.7
MT 1264	174	3.3	36.7	0.0	110.3	15.3	61.6
MT 1053	175	10.7	35.4	0.0	109.0	14.9	61.1
MT 1273	178	12.7	38.9	0.0	108.5	14.0	61.3
SY Tyra	175	2.7	33.5	0.0	108.0	13.8	61.4
McNeal	179	17.7	39.8	0.0	107.9	16.2	61.4
LIMAGR5	178	14.3	35.9	0.0	107.9	12.8	62.5
MT 1233	175	4.3	35.3	21.7	107.5	15.9	62.2
Vida	176	3.3	38.2	16.7	107.2	15.3	59.9
Choteau	177	5.0	36.5	1.7	106.7	15.4	61.1
MT 1172	176	0.0	37.4	1.7	106.5	15.9	60.5
MT 1235	177	12.3	38.3	0.0	106.3	15.3	62.5
MT 1211	173	7.7	37.0	0.0	106.1	15.1	61.7
MT 1234	178	16.3	38.3	0.7	105.9	15.4	61.4
WB Gunnison	173	11.7	36.3	0.0	105.8	14.8	61.1
MT 1225	176	26.7	36.2	33.3	105.7	15.2	60.9
MT 1213	176	2.3	39.5	1.7	104.8	15.6	60.8
Reeder	175	3.3	39.1	1.7	103.6	15.5	62.3
MT 1007	174	11.0	35.3	0.0	103.5	15.5	62.0

HD: heading date, SR: stripe rust, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight

Table 2. continued

Cultivar	HD Julian	SR %	HT in	LOD %	YLD bu/A	PRO %	TWT lb/bu
MT 1118	174	9.3	35.7	0.0	103.1	15.4	60.8
MT 1222	172	27.0	34.4	0.0	103.0	16.0	60.6
Conan	174	6.0	35.6	0.0	102.7	14.4	59.5
MT 1203	171	11.0	37.5	0.0	101.5	15.8	60.5
LCS Breakaway	174	0.7	37.9	26.7	100.3	15.8	62.2
MT 1216	176	29.0	39.0	51.7	99.6	15.6	61.3
MT 1252	180	65.0	38.3	63.3	99.5	13.3	60.6
SY Rowyn	175	4.0	36.0	65.0	99.1	14.5	62.2
MT 1276	174	3.3	36.7	0.0	98.0	15.4	60.6
MT 1224	176	17.3	37.7	11.7	97.3	14.8	59.2
MT 1228	177	26.7	36.2	13.3	96.9	14.8	61.0
Mott	179	24.7	41.3	0.0	96.3	15.2	62.9
Oneal	179	43.3	36.6	0.0	96.2	14.6	59.4
Corbin	175	5.7	36.1	56.7	95.7	14.9	59.7
Jedd	174	54.7	32.1	0.0	95.3	13.5	62.2
MT 1205	171	33.0	35.1	88.3	94.9	14.9	62.3
SY605 CL	172	3.7	38.9	8.3	94.5	16.8	62.5
MT 1173	178	11.7	37.9	15.0	94.2	15.5	60.4
SY Soren	175	4.0	36.6	0.0	94.2	15.7	62.9
WB Rockland	173	2.0	31.9	0.0	93.5	16.3	61.7
LCS Powerplay	175	4.3	37.0	26.7	93.3	14.8	61.9
Brennan	173	4.3	34.9	0.0	91.2	15.0	63.0
Fortuna	177	3.0	42.4	35.0	88.6	15.5	61.8
Thatcher	181	31.0	45.0	80.0	68.6	16.0	59.9
Mean	176.0	12.1	37.0	13.5	106.1	15.2	61.5
CV	1.0	69.0	6.7	88.0	5.2	0.0	0.1
LSD	2.0	13.5	4.0	19.2	8.9	0.0	0.1
Pr>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

HD: heading date, SR: stripe rust, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight

Project Title: Western Regional Soft White Spring Wheat Evaluation – 2013

Project Leader: Bob Stougaard

Project Personnel: Brooke Bohannon, Luther Talbert and Susan Lanning

Objective: To evaluate soft white spring wheat varieties for agronomic performance in environments representative of northwestern Montana.

Results:

There was no significant difference in yield among the varieties tested. Yields averaged 80.6 bu/A, and ranged from 93.5 bu/A for IDO852 to 49.5 bu/A for Treasure. However, significant differences were observed for each of the other agronomic traits. Test weights ranged from 59.8 lb/bu for IDO852 to 56.5 lb/bu for Treasure. Protein levels were between 13.3% for IDO854 to 11.5% for Louise. Thousand kernel weights ranged from 47.5 grams for Louise to 33.1 grams for Treasure. Falling numbers ranged from a low of 222.5 seconds for Treasure to a high of 362.9 seconds for Alpowa. All varieties showed some susceptibility to stripe rust. Infection ranged from 1.3% for WA8193 to 36.7% for IDO1301S. Lodging ranged from 0.0% for M12003 to 93.3% for Louise. Heights ranged from 35.4 inches for Nick to 42.0% for Alpowa.

Summary:

Treasure performed poorly. Aside from having the lowest yield, test weight, and falling numbers, it had the second highest incidence of lodging at 91.7 percent. Many of the plots were infested with quackgrass, which may have contributed to less than favorable yield performance for some varieties.

Table 1. Materials and Methods - Western Regional Soft White Spring Wheat - 2013

Seeding Date:	5/6/13	Fertilizer:	150-40-110-20
Julian Date:	126	Herbicide:	5/31/13
Seeding Rate:	80 lb/A		Affinity TankMix 0.6 OZ/A, MCPE
Previous Crop:	Barley		0.5 PT/A, Axial 16.4 FL OZ/A
Tillage:	Conventional		
Irrigation:	None	Harvest Date:	9/13/13
Soil Type:	Creston Sil	Julian Date:	256
Soil Test:	162-14-142		

Table 2. Western regional soft white spring wheat – 2013

Treatment	SR %	HD Julian	HT in	LOD %	YLD bu/A	PRO %	TWT lb/bu	TKW g	FN sec
IDO852	4.3	183	38.3	1.7	93.5	11.6	59.8	35.8	274.5
M12003	5.0	188	39.6	0.0	88.8	11.7	59.3	40.5	318.1
M12001	3.3	186	39.0	38.3	88.7	12.5	58.4	39.6	299.3
IDO1302S	2.3	187	38.1	21.7	86.9	12.4	59.2	42.9	282.4
IDO1301S	36.7	189	39.5	8.3	85.5	12.4	59.8	40.4	273.3
IDO851	6.7	186	41.3	75.0	85.4	11.7	59.2	41.5	296.9
ALTURAS	5.0	186	39.1	58.3	85.3	11.7	59.6	40.8	303.8
LOUISE	2.3	185	40.6	93.3	84.7	11.5	57.8	47.5	283.5
ALPOWA	20.0	187	42.0	13.3	81.7	12.5	58.7	38.8	362.9
WA 8193	1.3	184	36.7	26.7	75.4	11.6	58.7	39.5	257.5
NICK	11.7	182	35.4	1.7	72.8	12.8	57.4	37.9	306.6
IDO854	6.0	184	41.5	15.0	69.8	13.3	59.5	42.2	260.0
TREASURE	11.7	188	39.9	91.7	49.5	11.7	56.5	33.1	222.5
Mean	9.0	185.7	39.3	34.2	80.6	12.1	58.8	40.0	287.8
CV	66.0	0.4	3.6	75.3	20.7	3.5	1.2	4.5	6.9
LSD	10.0	1.1	2.4	43.4	28.1	0.7	1.2	3.0	33.5
Pr>F	0.0001	0.0001	0.0003	0.0003	0.2148	0.0002	0.0001	0.0001	0.0001

SR: stripe rust, HD: heading, HT: height, LOD: lodging, YLD: Yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number

Project Title: Wild Oat Herbicide Evaluation in Spring Wheat – 2013

Project Leader: Bob Stougaard

Project Personnel: Brooke Bohannon

Objective: To evaluate the effects of herbicides and application timing on wild oat control.

Results:

Seven herbicide treatments were compared for effectiveness in controlling wild oat. The experimental design was a randomized complete block with three replications. Hank spring wheat was planted at a rate of 80 lb/A on April 16. Wild oats were seeded in the center of each plot on April 24 at a rate of 60 lb/A. The first herbicide treatments were applied on May 31 when wild oats had 1 tiller (1T), and averaged 7 inches tall. The second herbicide treatments were applied on June 6 when the wild oats had two tillers (2T) and average 12 inches tall.

Crop injury was minor with all treatments ranging from 27% to 3% (Table 2). Wolverine and Huskie Complete had the least amount of injury. Concurrently, Wolverine and Huskie Complete were the least effective in controlling wild oat. Rimfire Max provided the greatest wild oat control. Application timing had an impact on some treatments. Most notably, Huskie Complete at the 1T application provided superior control compared to 2T application. Wild oat control with Varro was less complete than Rimfire Max, but better than Wolverine. Differences in yield were observed between treatments with treatment 2 yielding the highest at 91 bu/A. Although wild oat control was comparable between the two application times, yields with Wolverine differed between application timings. Yields were less when Wolverine was applied at the 2T stage of growth due to the greater duration of wild oat competition.

Table 1. Material and Methods -Bayer spring wheat herbicide - 2013

Seeding Date:	4/16/13	Fertilizer:	150-40-110-20
Julian Date:	106	Fungicide:	6/19/13
Seeding Rate:	80 lb/A		Quilt 14 FL OZ/A
Previous Crop:	Barley	Insecticide:	6/27/13
Tillage:	Conventional		Warrior II 1.5 FL OZ/A
Irrigation:	None		
Soil Type:	Creston Sil	Harvest Date:	8/19/13
Soil Test:	151-10-278-58	Julian Date:	231

Table 2. Herbicide evaluation for crop tolerance and control of wild oat in spring wheat - 2013.

			Crop injury		Wild oat			YLD	TWT
			6/6	6/21	6/6	6/21	7/16		
Treatment	Rate	Timing	———%———		——————%——————			bu/A	lb/bu
Check			0.0	0.0	0.0	0.0	0.0	62.8	60.0
Rimfire Max	3.0 OZ WT/A	1T	21.7	17.3	26.7	73.3	94.3	90.8	60.2
Huskie	11.0 FL OZ/A								
MSO	1.5 PT/A								
Rimfire Max	3.0 OZ WT/A	1T	15.0	14.0	33.3	68.3	94.7	84.8	59.6
Huskie	11.0 FL OZ/A								
Quad 7	0.8 PT/A								
Wolverine	27.4 FL OZ/A	1T	6.7	3.3	20.0	48.3	63.3	88.2	59.4
Huskie Complete	13.7 FL OZ/A	1T	18.3	17.3	33.3	71.7	88.3	82.5	59.4
Ammonium Sulfate	0.5 LB/A								
Varro	6.9 FL OZ/A	1T	18.3	26.7	18.3	57.7	81.7	84.3	60.4
Carnivore	1.0 PT/A								
Huskie Complete	13.7 FL OZ/A	2T	0.0	8.3	0.0	30.0	70.0	85.3	59.4
Ammonium Sulfate	0.5 LB/A								
Wolverine	27.4 FL OZ/A	2T	0.0	3.3	0.0	53.3	70.0	72.1	58.7
Mean			10.0	11.3	16.5	50.3	70.3	81.4	59.7
CV			29.6	44.6	17.4	22.8	6.9	10.7	1.4
LSD			5.2	8.8	5.0	20.1	8.4	15.3	1.4
PR>F			0.0001	0.0002	0.0001	0.0001	0.0001	0.0249	0.3216

1T: Wild oat at 1 tiller, 2T: Wild oat at two tillers, YLD: yield, TWT: test weight

Project Title:	Effect of Plant Growth Regulators (PGRs) and Fungicides on the Performance of Winter Wheat Varieties.
Project Leader:	Bob Stougaard
Project Personnel:	Brooke Bohannon
Objective:	To evaluate the effects of PGRs and fungicides on the agronomic performance of winter wheat varieties.

Lodging and stripe rust are recurring problems in winter wheat. This study was designed to determine which production issue has the most negative effect on winter wheat performance. The study consisted of seven winter wheat varieties which varied in height and susceptibility to stripe rust. The varieties included Bynum, Curlew, Decade, Jagalene, Promontory, Whetstone, and Yellowstone. These varieties were then either treated with the fungicide Quilt, the PGR Palisade, or the combination of Quilt plus Palisade. A non-treated control was also included for each variety. The treatments were applied on May 25 when the crop was in the mid-boot stage and plant height varied from 18 to 26 inches.

Plant height averaged 40 inches and ranged from 37 inches for Decade to over 43 inches for Bynum (Table 3). Not surprisingly, there was a relationship between height and lodging, with the tallest varieties expressing the greatest degree of lodging. Palisade applied alone, or in combination with Quilt, reduced plant height on average by 2.5 inches and reduced lodging an average of 14 percent. However, Palisade applied alone did not improve yields compared to the non-treated check (Table 2). In short, lodging did not adversely impact yields.

Wheat varieties varied in susceptibility to stripe rust. Decade demonstrated the greatest susceptibility, and averaged 96% infection on July 15, while Whetstone demonstrated the highest degree of resistance, with an average infection level of 35.4 percent (Table 3). Quilt applied alone, or with palisade, reduced the severity of stripe rust at the July 15 rating by an average of more than 20 percent. However, fungicide effects were no longer detectable at the July 23 rating. There was a strong relationship between stripe rust infection and yield. Accordingly, quilt treatments improved yields an average of 14 bu/A (Table 2). The impact of quilt on yield did vary by cultivar, with Bynum, Decade, Jagalene and Whetstone realizing the greatest benefit (Table 4). Overall, stripe rust had the greatest negative effect on yield. Consequently, fungicide applications had the greatest impact on yield and grain quality.

Table 1. Materials and Methods - Winter wheat inputs (mwbc) - 2013

Seeding Date:	9/25/12	Fertilizer:	10-35-90-8.5-0.85/ TD 60-0-0
Julian Date:	269	Herbicide:	4/26/13 @ 3-4 tiller
Seeding Rate:	80 lb/A		Rimfire 3 OZ/A, Affinity
Previous Crop:	Peas		TankMix 0.6 FL OZ/A, NIS 0.25%
Tillage:	Conventional		
Irrigation:	None	Harvest Date:	8/8/13
Soil Type:	Creston Sil	Julian Date:	220
Soil Test:	264-6-166		

Table 2. Main effect of fungicide and PGR inputs on agronomic performance of winter wheat. Kalispell, 2013.

	Stripe rust										
	15-Jul	23-Jul	HD	HT	LOD	YLD	PRO	TWT	TKW	FN	MC
Input	%	%	Julian	in	%	bu/A	%	lb/bu	g	sec	%
Check	42.6	71.3	159	41.1	15.0	109.1	12.7	58.3	32.4	321.4	13.2
Palisade	37.7	72.7	160	38.5	3.2	112.7	12.7	59.4	33.2	315.3	13.5
Quilt	20.2	59.0	160	41.4	18.5	123.7	12.7	60.3	35.1	322.0	14.0
Palisade & Quilt	15.9	66.0	160	39.1	3.5	123.2	12.8	60.9	35.7	315.9	13.9
LSD	5.2	12.2	0.8	1.0	7.6	10.7	NS	0.9	1.5	NS	0.5
Pr>F	0.0001	0.1104	0.0327	0.0009	0.0052	0.0345	0.5515	0.0021	0.0049	0.4580	0.0206

HD: heading, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number, MC: moisture.
NS: nonsignificant.

Table 3. Main effect of cultivars on agronomic performance of winter wheat. Kalispell, 2013.

	Stripe rust										
	15-Jul	23-Jul	HD	HT	LOD	YLD	PRO	TWT	TKW	FN	MC
Cultivar	%	%	Julian	in	%		%	lb/bu	g	sec	%
Bynum	42.5	94.5	159	43.3	33.0	101.5	13.6	60.2	33.7	376.0	12.7
Curlew	11.8	47.5	160	43.0	27.3	125.3	12.9	60.8	32.9	310.7	14.4
Decade	71.2	96.1	160	37.0	0.2	72.9	13.0	51.9	25.1	373.2	11.9
Jagalene	27.8	74.6	158	38.6	0.3	121.4	12.4	60.9	37.3	352.7	12.6
Promontory	10.5	82.1	160	39.7	1.9	135.2	11.7	62.6	38.1	147.0	14.4
Whetstone	14.3	35.4	157	37.7	1.7	128.7	13.2	60.7	34.5	367.8	12.7
Yellowstone	25.6	40.4	162	41.0	6.1	135.1	12.3	60.8	37.0	303.3	17.0
LSD	8.5	12.6	0.8	0.9	11.1	5.8	0.2	1.0	1.1	11.2	0.4
Pr>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

HD: heading, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number, MC: moisture.
NS: nonsignificant.

Table 4. Effect of fungicide and PGR inputs on winter wheat agronomic performance. Kalispell, 2013

Cultivar	Stripe rust 7/15 %	Stripe rust 7/23 %	HD Julian	HT in	LOD %	YLD bu/A
			Check			
Bynum	66.0	97.0	157	45.0	55.7	93.0
Curlew	13.3	45.0	160	44.4	38.7	120.7
Decade	98.0	97.0	159	37.8	0.0	57.8
Jagalene	51.7	80.0	158	38.9	0.0	110.2
Promontory	16.0	83.3	159	40.4	3.3	132.7
Whetstone	23.0	38.3	155	38.9	2.3	117.3
Yellowstone	30.0	58.3	161	42.6	5.0	131.9
			Palisade			
Bynum	58.3	97.7	159	40.0	1.0	98.3
Curlew	16.0	55.0	160	41.9	18.7	126.3
Decade	99.0	97.7	161	36.1	0.0	55.7
Jagalene	38.3	76.7	158	38.1	0.0	117.1
Promontory	9.7	96.7	161	38.6	0.0	130.7
Whetstone	18.0	36.7	157	36.2	1.3	127.1
Yellowstone	24.7	48.3	163	38.7	1.3	133.6
			Quilt			
Bynum	25.3	90.0	159	47.1	66.0	106.3
Curlew	10.7	28.3	160	43.6	38.7	122.9
Decade	50.0	96.3	160	38.2	0.7	91.3
Jagalene	11.7	66.7	159	39.7	1.0	129.4
Promontory	8.7	68.3	160	40.4	4.3	138.2
Whetstone	9.0	36.7	157	38.5	1.7	136.9
Yellowstone	26.3	26.7	162	42.1	17.0	140.7
			Palisade & Quilt			
Bynum	20.3	93.3	160	40.9	9.3	108.2
Curlew	7.3	61.7	161	42.1	13.0	131.4
Decade	37.7	93.3	161	35.9	0.0	86.8
Jagalene	9.7	75.0	158	37.9	0.0	129.1
Promontory	7.7	80.0	160	39.3	0.0	139.0
Whetstone	7.3	30.0	158	37.3	1.3	133.4
Yellowstone	21.3	28.3	162	40.5	1.0	134.2
Grand Mean	29.1	67.2	159	40.0	10.1	117.2
CV	35.50	22.73	0.59	2.77	133.77	6.05
LSD	17.05	NS	NS	1.83	22.18	11.69
Pr>F	0.0001	0.6791	0.4397	0.0101	0.0078	0.0094

HD: heading,HT: height, LOD: lodging, YLD: yield

Table 5. Effect of fungicide and PGR inputs on winter wheat agronomic performance. Kalispell, 2013.

Cultivar	PRO %	TWT lb/bu	TKW g	FN sec	MC %
			Check		
Bynum	13.4	59.4	32.6	373.4	12.5
Curlew	12.9	59.9	31.6	312.5	13.8
Decade	13.3	47.5	21.1	380.9	11.4
Jagalene	12.2	58.8	35.4	351.8	12.3
Promontory	11.4	61.8	36.7	162.3	13.9
Whetstone	13.0	60.0	33.3	357.3	13.0
Yellowstone	12.4	60.5	36.1	311.9	15.8
			Palisade		
Bynum	13.2	60.4	32.4	361.6	12.7
Curlew	12.9	61.1	33.2	310.2	14.3
Decade	13.3	49.0	22.1	380.4	11.8
Jagalene	12.3	61.5	36.7	346.5	12.8
Promontory	11.7	62.6	37.5	144.4	14.1
Whetstone	13.2	60.5	34.0	372.2	12.2
Yellowstone	12.2	60.6	36.7	291.5	16.5
			Quilt		
Bynum	14.1	59.9	35.0	384.2	12.6
Curlew	12.9	60.7	32.9	316.7	14.9
Decade	12.6	54.7	28.2	371.5	11.8
Jagalene	12.3	62.0	38.3	346.4	12.7
Promontory	11.8	62.9	38.5	152.7	14.9
Whetstone	13.2	61.0	35.2	370.6	13.0
Yellowstone	12.3	60.6	37.5	311.9	17.9
			Palisade & Quilt		
Bynum	13.7	61.1	35.0	384.7	12.9
Curlew	12.9	61.5	33.8	303.5	14.7
Decade	12.7	56.4	29.2	359.9	12.4
Jagalene	12.7	61.5	38.9	365.9	12.4
Promontory	11.9	63.2	39.7	128.6	14.6
Whetstone	13.4	61.1	35.4	371.2	12.7
Yellowstone	12.2	61.3	37.8	297.8	17.6
Grand Mean	12.7	59.7	34.1	318.7	13.7
CV	1.73	2.04	3.87	4.26	3.89
LSD	0.36	2.01	2.18	NS	NS
Pr>F	0.0001	0.0001	0.0042	0.0900	0.0993

PRO: protein, TWT: test wt, TKW 1000 kernal wt, FN: falling No., MC: moisture

Project Title: Fungicide Evaluation in Winter Wheat – 2013

Project Leader: Bob Stougaard

Project Personnel: Brooke Bohannon

Objective: To evaluate fungicides for control of stripe rust in winter wheat.

Results:

Six fungicide treatments were evaluated for control of stripe rust in winter wheat. The experimental design was a randomized complete block with three replications. Norris winter wheat was planted on September 20, 2012 with a no-till drill into a minimum-till seedbed. Applications were made at jointing (J) on May 8 and at early boot (B) on May 24. Early boot treatments were reapplied on June 3.

Stratego applied at jointing failed to provide acceptable control of stripe rust and produced yields comparable to the check. Excellent control of stripe rust was obtained with the early boot treatments, resulting in a 10 bu/A yield advantage compared to the check. Stripe rust control and yield were comparable among the early boot treatments. No significant differences were observed in percent protein, test weight or falling numbers.

Table 1. Material and Methods - Fungicide evaluatin in winter wheat - 2013

Seeding Date:	9/20/12	Fertilizer:	10-35-90-8.5-0.85/ TD 60-0-0
Julian Date:	264	Herbicide:	04/26/13
Seeding Rate:	80 lb/A		Rimfire 3 OZ/A, Affinity TankMix
Previous Crop:	Peas		0.6 FL OZ/A, NIS 0.25%
Tillage:	Minimal till	Insecticide:	none
Irrigation:	None	Harvest Date:	7/31/13
Soil Type:	Kalispell vfsl	Julian Date:	212
Soil Test:	79.5-40-380		

Table 2. Fungicide evaluation for crop tolerance and stripe rust control in winter wheat - 2013

Treatment	Rate	Timing	Crop injury 6/3	Crop injury 6/14	Stripe rust 7/4	Stripe rust 7/15	YLD	PRO	TWT	FN
			——%——		——%——		bu/A	%	lb/bu	sec
1 Check			0.0	0.0	53.3	74.3	89.7	12.4	61.0	342.4
2 Stratego	4 FL OZ/A	J	0.0	0.0	55.0	68.7	94.1	12.2	61.9	345.7
3 Stratego YLD	4 FL OZ/A	B	0.0	0.0	16.7	33.3	101.8	12.1	63.1	344.2
Induce 90 SL	0.125 % V/V									
4 Absolute 500 SC	4 FL OZ/A	B	0.0	0.0	11.7	16.7	99.8	12.0	62.8	341.2
Induce 90 SL	0.125 % V/V									
5 Prosaro 421 SC	5 FL OZ/A	B	0.0	0.0	11.7	36.0	103.1	12.4	62.5	342.7
Induce 90 SL	0.125 % V/V									
6 Prosaro 421 SC	6.5 FL OZ/A	B	0.0	0.0	10.0	13.3	101.1	12.6	62.5	327.0
Induce 90 SL	0.125 % V/V									
7 Tilt	4 FL OZ/A	B	0.0	0.0	10.0	18.3	101.5	12.3	62.6	339.0
Mean			0.0	0.0	24.1	37.2	98.7	12.3	62.3	340.3
CV			0.0	0.0	72.8	57.0	4.7	3.3	1.2	3.0
LSD			0.0	0.0	31.2	37.7	8.3	0.7	1.3	18.2
PR>F			1.000	1.000	0.0166	0.0173	0.0376	0.5718	0.0634	0.4025

J: jointing, B: early boot, YLD: yield, PRO: protein, TWT: test weight, FN: falling number

Project Title:	Evaluation of Clearfield Winter Wheat Cultivars for Herbicide Tolerance – 2013
Project Leader:	Bob Stougaard
Project Personnel:	Brooke Bohannon, Phil Bruckner, and Jim Berg
Objective:	To evaluate experimental lines for herbicide tolerance and agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

Seven experimental winter wheat lines, with genes for resistance to the imidazolinone herbicides, were planted in a split-plot design and replicated three times. A non-treated control was included to compare the effects of herbicide treatments where Beyond was applied at 2X rate (12 oz/A) with either MSO or NIS adjuvants.

Plants were assessed for herbicide injury with head deformation, which ranged from 40.3 percent for MTCS1202 to 0.0 percent for MTCS 1077. Yields ranged from 116.9 bu/A for MTCS1131 to 100.6 bu/A for MTCS 1203. Test weights ranged from 58.5 lb/bu for MTCS1131 to 56.5 for MTCS1203. All lines showed moderate to high susceptibility to stripe rust, which ranged from 56.7 percent for MTCS1077 to 71.7 percent infection for MTCS1201. Lodging ranged from 0.6 percent for MTCS1202 to 25.3 percent for MTCS1077. Plant heights ranged from 38.3 inches for MTCS1202 to 41.2 inches for MTCS1201.

Summary:

Significant differences in agronomic traits were not observed between herbicide treatments, but were observed among experimental lines (Table 2).

Table 1. Materials and Methods - Winter wheat IMI (mwbc) - 2013

Seeding Date:	9/25/12	Soil Type:	Creston Sil
Julian Date:	269	Soil Test:	264-6-166
Seeding Rate	80 lb/A	Fertilizer:	10-35-90-8.5-0.85/ TD 60-0-0
Previous Crop:	Peas	Pesticide:	NA
Tillage:	Conventional	Harvest Date:	8/8/13
Irrigation:	None	Julian Date:	220

Table 2. Winter wheat clearfield qualifications– 2013

	HDFRM %	SR %	HD Julian	HT in	LOD %	YLD bu/A	TWT lb/bu	MC %
Herbicide								
0X	17.3	68.1	158	39.7	4.0	109.5	56.9	11.7
2XNIS	18.4	59.3	159	40.5	16.2	110.7	57.7	12.0
2XMSO	17.4	66.2	159	39.7	2.4	107.8	57.5	11.8
LSD	6.4	18.2	0.9	2.1	14.8	9.7	0.9	0.4
Pr>F	0.8742	0.4452	0.2184	0.5832	0.1106	0.7207	0.1757	0.3056
Experimental Line								
MTCS1204	31.3	71.1	159	39.9	4.4	114.2	57.4	11.9
MTCS1201	0.2	71.7	158	41.2	5.3	101.1	56.9	11.8
MTCS1131	3.4	63.9	159	39.7	9.1	116.9	58.5	12.2
MTCS1261	38.7	63.3	159	41.0	1.1	109.1	57.3	11.7
MTCS1202	40.3	58.9	159	38.3	0.6	112.8	57.7	11.4
MTCS1203	9.8	66.1	158	39.5	6.9	100.6	56.5	11.8
MTCS1077	0.0	56.7	159	40.3	25.3	110.4	57.4	12.1
LSD	7.3	9.3	1.1	0.8	10.7	6.0	0.7	0.3
Pr>F	0.0001	0.0161	0.2289	0.0001	0.0008	0.0001	0.0001	0.0001

HDFRM: head deformation, SR: stripe rust, HD: heading, HT: height, LOD: lodging, YLD: Yield, TWT: test weight, MC: moisture content

Project Title: Evaluation of Winter Wheat Experimental Lines - 2013

Project Leader: Bob Stougaard

Project Personnel: Brooke Bohannon, Phil Bruckner, and Jim Berg

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

Results:

Stripe rust negatively affected winter wheat yield and quality (Table 2). As percent infection increased, grain yields and test weights decreased, while protein increased. Average days to heading was 158 (June 7) and ranged from 154 (June 3) to 162 (June 11). Plant height averaged 42 inches and ranged from 36.6 for Carter to 48.8 for Jerry. Lodging averaged 10 percent for the nursery. However, several cultivars lodged greater than 50% including Bynum, Rampart, and MTS0826-63. Yields averaged 97 bu/A with Promontory again yielding the highest at 138 bu/A and MTS0832 yielding the lowest at 17 bu/A. Test weights averaged 56 lb/bu and ranged from a high of 62.8 for promontory to a low of 38.2 for Bearpaw.

Summary:

Stripe rust resistance is the primary determinate of winter wheat yield and quality. Promontory and Yellowstone continue to be the top yielding cultivars.

Table 1. Material and Methods - Winter wheat intrastate - 2013

Seeding Date:	9/25/12	Fertilizer:	10-35-90-8.5-0.85/ TD 60-0-0
Julian Date:	269	Herbicide:	4/26/13 @ 3-4 tiller
Seeding Rate:	80 lb/A		Rimfire 3 OZ/A, Affinity TankMix
Previous Crop:	Peas		0.6 FL OZ/A, NIS 0.25%
Tillage:	Conventional		
Irrigation:	None	Harvest Date:	8/12/13
Soil Type:	Creston Sil	Julian Date:	224
Soil Test:	264-6-166		

Table 2. Agronomic date from the intrastate winter wheat nursery, Kalispell 2013

Cultivar	Stripe rust 6/14	Stripe rust 7/16	HD	HT	LOD	YLD	PRO	TWT
	———%———		Julian	in	%	bu/A	%	lb/bu
Promontory	3.7	74.3	157	43.0	0.0	138.8	11.9	62.8
MT1117	1.0	23.3	160	43.3	6.3	132.6	11.7	61.2
MT1138	0.7	48.3	159	44.1	0.0	130.5	12.4	60.3
MT08172	2.3	40.0	161	42.4	0.0	128.3	13.1	59.9
MT0978	2.7	27.0	161	42.4	25.7	125.0	13.1	57.1
Yellowstone	2.3	75.7	160	43.7	0.0	124.6	12.4	59.2
MTW08168	3.7	70.0	161	45.7	46.3	122.1	11.8	58.3
Art	2.7	83.3	155	41.1	2.7	121.9	12.6	59.5
MTCL1131	1.3	36.7	159	44.5	1.3	121.7	12.0	59.6
Curlew	3.0	63.7	158	44.0	34.3	121.6	13.1	60.1
Robidoux	4.7	67.0	154	41.7	15.0	120.6	12.0	58.4
MTCL1077	6.0	85.0	160	43.6	0.0	118.0	12.0	59.6
Radiant	8.0	43.3	160	43.7	0.0	115.8	12.5	61.5
MTS0808	1.7	31.7	158	39.2	33.7	115.6	13.1	60.9
MT1092	3.7	87.3	160	42.8	0.0	115.6	11.4	58.8
MTS1024	10.3	93.0	159	37.5	0.0	115.5	12.6	57.1
SY Wolf	0.0	35.0	155	39.7	0.0	114.8	13.4	59.3
MT1108	2.0	91.7	158	42.2	3.3	113.7	11.7	58.9
MT1113	2.0	76.0	160	43.0	1.3	113.2	11.9	60.5
MT1091	8.0	90.0	158	41.4	0.0	112.8	13.1	55.5
MT1156	3.0	20.0	160	41.8	30.7	112.8	12.5	59.5
MT1090	6.3	80.0	158	43.6	0.0	111.5	12.3	57.5
WB-Quake	3.3	60.3	161	42.3	6.7	110.1	12.6	60.0
MT10116	14.0	85.0	161	41.1	1.0	107.9	12.4	58.7
Jagalene	8.7	55.0	157	40.7	1.3	107.6	12.9	59.0
Judee	6.3	30.0	159	39.1	31.0	107.0	12.2	57.4
MTS0826-63	3.3	51.7	162	39.9	54.3	106.8	13.6	61.0
MT1143	5.0	98.3	156	39.3	0.0	106.7	12.8	58.1
MT1078	9.0	95.0	159	40.1	0.0	106.5	13.6	53.7
MT1102	4.7	90.0	159	40.3	0.0	105.9	13.4	56.0
MT1105	4.7	91.3	159	42.1	1.3	104.6	12.3	58.0
Ledger	4.7	100.0	157	41.3	0.0	100.7	11.8	58.3
Broadview	21.7	100.0	161	38.4	0.0	88.7	13.1	48.8
Rampart	3.7	98.3	159	42.3	74.0	85.6	13.4	58.0
Bynum (CL)	3.7	100.0	157	44.8	66.0	85.6	13.3	59.3

HD: heading, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight

Table 2. continued

	Stripe rust		HD	HT	LOD	YLD	PRO	TWT
	6/14	7/16						
Cultivar	———%———		Julian	in	%	bu/A	%	lb/bu
Overland	12.0	100.0	156	44.7	0.0	79.0	12.9	53.1
McGill	32.3	100.0	154	42.9	0.0	77.5	11.8	55.4
CDC Falcon	19.3	100.0	158	39.2	1.3	76.9	12.4	56.2
Cowboy	13.7	100.0	157	39.8	0.0	72.5	12.7	51.5
Norris (CL)	12.3	100.0	155	46.2	0.0	72.2	13.4	55.7
MT1137	27.3	100.0	158	41.5	0.0	71.7	12.9	54.2
Accipiter	36.7	100.0	161	39.4	1.7	64.0	12.1	54.8
WB-Matlock	29.7	100.0	159	45.3	0.0	59.2	13.7	50.1
Genou	26.7	100.0	159	44.2	39.0	57.7	13.7	49.9
Bearpaw	32.3	100.0	157	39.8	15.7	54.9	16.4	38.2
Jerry	16.7	100.0	160	48.8	5.3	43.5	13.6	44.6
Decade	14.7	100.0	157	39.9	0.0	43.0	15.3	42.6
Carter	38.3	100.0	157	36.6	0.0	26.7	15.4	46.5
MTS0832	55.3	100.0	161	42.5	7.3	17.3	16.5	43.8
Mean	11.0	77.5	158.5	42.0	10.3	97.7	12.9	56.1
CV	85.2	14.1	0.6	3.2	163.7	13.0	0.0	0.0
LSD	15.2	17.7	1.5	2.2	27.4	20.5	0.0	0.0
Pr>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1.000	1.000

HD: heading, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight

Project Title:	Evaluation of Herbicides in Winter Wheat – 2013
Project Leader:	Bob Stougaard
Project Personnel:	Brooke Bohannon
Objective:	Evaluate crop tolerance and weed control efficacy of several broadleaf and grass herbicides in winter wheat.

Results:

Seven herbicide treatments were compared in order to evaluate crop injury and weed control. The experimental design was a randomized complete block with three replications. Norris winter wheat was planted with a no-till drill into minimally tilled ground on September 20, 2012. Herbicide applications were made at jointing on May 8, 2013.

Crop injury was not observed among any of the treatments. All herbicide treatments provided comparable control of wild buckwheat, common lambsquarters, common chickweed and henbit (Table 2). Treatments that contained thiencarbazone (Huskie Complete and Varro) provided the greatest level of quackgrass control. No significant differences were observed in yield, protein or test weight.

Table 1. Materials and Methods - herbicide evaluation in winter wheat - 2013

Seeding Date:	9/20/12	Soil Type:	Kalispell vfsl
Julian Date:	264	Soil Test:	79.5-40-380
Seeding Rate:	80 lb/A	Fertilizer:	10-35-90-8.5-0.85/ TD 60-0-0
Previous Crop:	Peas	Pesticide:	NA
Tillage:	Minimal till	Harvest Date:	7/31/13
Irrigation:	None	Julian Date:	212

Table 2. Herbicide evaluation for crop tolerance and grain quality in winter wheat- 2013

Treatment	Rate		CI 5/15	CI 6/3	POLCO 6/3	CHEAL 6/3	STEME 6/3	LAMAM 6/3
			———%———		————————%————————			
1 Check			0.0	0.0	0.0	0.0	0.0	0.0
2 Huskie	13.5	FL OZ/A	0.0	0.0	96.0	99.0	84.7	99.0
Axial XL	16.4	FL OZ/A						
AMS	0.5	LB/A						
3 Huskie	13.5	FL OZ/A	0.0	0.0	92.7	99.0	76.3	96.0
Axial XL	16.4	FL OZ/A						
AMS	0.5	LB/A						
NIS	0.25	% V/V						
4 Widematch	1	PT/A	3.3	0.0	99.0	99.0	99.0	94.3
Axial XL	16.4	FL OZ/A						
MCPA Ester	0.5	PT/A						
5 Huskie	13.5	FL OZ/A	0.0	0.0	94.3	99.0	88.0	99.0
Starane	5	FL OZ/A						
Axial XL	16.4	FL OZ/A						
AMS	0.5	LB/A						
NIS	0.25	% V/V						
6 Wolverine	27.4	FL OZ/A	0.0	0.0	94.7	99.0	94.7	99.0
7 Huskie Complete	13.7	FL OZ/A	3.3	0.0	84.7	99.0	86.0	99.0
AMS	0.5	LB/A						
8 Varro	6.85	FL OZ/A	0.0	0.0	99.0	99.0	97.7	99.0
Carnivore	1	PT/A						
Mean			0.8	0.0	82.5	86.6	78.3	85.7
CV			320.7	0.0	11.4	0.0	17.5	3.7
LSD			4.7	0.0	16.5	0.0	24.0	5.6
Pr>F			0.4706	1	0.0001	1	0.0001	0.0001

AMS: ammonium sulfate, NIS: non-ionic surfactant, CI: crop injury, POLCO: wild buckwheat, CHEAL: common lambsquarters, STEME: common chickweed, LAMAM: henbit

Table 2. continued.

Treatment	Rate	POLCO 7/4	CHEAL 7/4	STEME 7/4	AGRRE 7/4	YLD	PRO	TWT
		———————%———————				bu/A	%	lb/bu
1 Check		0.0	0.0	0.0	0.0	61.2	13.4	55.4
2 Huskie	13.5 FL OZ/A	80.0	99.0	86.0	62.7	58.8	13.5	54.9
Axial XL	16.4 FL OZ/A							
AMS	0.5 LB/A							
3 Huskie	13.5 FL OZ/A	76.3	96.0	59.7	0.0	55.5	13.6	53.8
Axial XL	16.4 FL OZ/A							
AMS	0.5 LB/A							
NIS	0.25 % V/V							
4 Widematch	1 PT/A	97.7	96.0	82.7	16.7	56.1	14.0	53.3
Axial XL	16.4 FL OZ/A							
MCPA Ester	0.5 PT/A							
5 Huskie	13.5 FL OZ/A	81.7	96.0	66.0	46.7	58.6	13.6	54.5
Starane	5 FL OZ/A							
Axial XL	16.4 FL OZ/A							
AMS	0.5 LB/A							
NIS	0.25 % V/V							
6 Wolverine	27.4 FL OZ/A	88.0	97.7	86.0	49.7	62.9	13.6	55.1
7 Huskie Complete	13.7 FL OZ/A	92.7	99.0	92.7	92.7	60.9	13.5	55.2
AMS	0.5 LB/A							
8 Varro	6.85 FL OZ/A	99.0	99.0	96.0	99.0	64.2	13.6	56.0
Carnivore	1 PT/A							
Mean		76.9	85.3	71.1	45.9	59.8	13.6	54.8
CV		18.8	4.1	29.4	57.6	8.3	3.5	3.4
LSD		25.3	6.1	36.6	46.3	8.7	0.8	3.2
Pr>F		0.0001	0.0001	0.0013	0.0017	0.3882	0.8383	0.6913

AMS: ammonium sulfate, NIS: non-ionic surfactant, CI: crop injury, POLCO: wild buckwheat, CHEAL: common lambsquarters, STEME: common chickweed, ACRRE: quackgrass, YLD: yield, PRO: protein, TWT: test weight

FORAGES

Project Title:	Effects of Sulfur Fertilizer Sources on Alfalfa Yield and Quality – 2013
Project Leader:	Bob Stougaard
Project Personnel:	Brooke Bohannon and Grant Jackson
Objective:	To evaluate the effects of sulfur fertilizer sources on alfalfa yield and quality.

Results:

Four sulfur based fertilizer formulations were compared to evaluate the impact on alfalfa yield and quality. The experimental design was a randomized complete block with four replications. Sulfur treatments were applied at a rate of 60 lb/A on April 3 when the crop averaged 2 inches in height. Crop year (starting September 1, 2012) precipitation received prior to first harvest was 16.41 inches and prior to second harvest was 17.21 inches. The second cutting received an additional 3.2 inches of irrigation water.

Significant yield differences were observed at first harvest, with higher hay yields being observed for the check compared to Vitasul. There were no differences in yield during the second harvest, and there were no differences in quality among the treatments at either harvest. In short, sulfur did not appear to improve alfalfa yield or quality.

Table 1. Material and Methods - Alfalfa sulfur - 2013

Seeding Date:	6/1/11	Fertilizer:	0-50-200-60
Julian Date:	152	Herbicide:	2011
Seeding Rate:	14 lb/A		Raptor 5 OZ/A
Previous Crop:	Barley		
Tillage:	Conventional	1st Harvest Date:	6/27/13
Irrigation:	None	Julian Date:	178
Soil Type:	Kalispell vfsl	2nd Harvest Date:	8/6/13
Soil Test:	105-14-148-40	Julian Date:	218

Table 2. Effects of sulfur fertilizer sources on alfalfa yield and quality – 2013

		Harvest 1					Harvest 2				
	HT	YLD	CP	SP	Sulfur	RFV	YLD	CP	SP	Sulfur	RFV
Treatment	in	ton/A	————————%————————				ton/A	————————%————————			
1 Vitasul	41	2.6	17.9	48.0	0.7	115.0	1.1	20.3	44.8	0.3	163.0
2 Tiger	41	3.3	17.3	49.5	0.5	116.3	1.2	21.2	44.3	0.3	163.8
3 Gypsum	38	2.8	18.0	47.8	0.5	117.8	1.3	22.2	45.5	0.3	168.8
4 Potassium sulfate	39	3.1	18.5	49.0	0.3	116.3	1.4	21.7	45.3	0.3	171.8
5 S check	37	3.2	18.8	50.8	0.6	123.0	1.4	22.2	47.0	0.3	165.3
Mean	39	3	18	49	1	118	1	22	45	0	167
CV	8	10	8	5	30	7	29	6	8	8	7
LSD	4.77	0.44	2.19	3.87	0.24	13.15	0.56	2.11	5.64	0.04	16.73
Pr>F	0.2051	0.0304	0.6348	0.4782	0.0784	0.7074	0.7786	0.3124	0.8572	0.5258	0.765

HT: height, YLD: yield, CP: crude protein, SP: soluable protein, RFV: relative feed value

OILSEEDS

Project Title: Canola Planting Date and Population Study

Project Leader: Bob Stougaard

Project Personnel: Brooke Bohannon

Objective: To identify the optimum canola planting date and density for northwestern Montana.

Materials and Methods:

The factorial treatment arrangement consisted of three canola varieties, three seeding dates, and three plant densities. The three varieties selected were DKL30-42, HyClass 955, and InVigor L130, representing early, medium and late maturity groups, respectively. The seeding dates were April 17, May 9 and May 21. The first seeding date was selected when soil temperature reached 50°F at 2 inches. Subsequent planting dates were seeded at increments of 300 growing degree days (GDD32), which represents the number of GDD necessary for the first true leaves to emerge. The targeted plant populations were 4, 8 and 16 plants per square foot. Seeding rates were calculated using the following formula: (9.6 x desired plants per square foot x thousand kernel weight) / percent survival (Table 1). The experimental design was a randomized complete block with three replications.

Soil test results showed 202-6-162-38 pounds of available nutrients and a fertilizer blend of 0-40-40-20 was broadcasted and incorporated on April 9. Flea beetle pressure was high in early June and a single application of Warrior II was applied to the entire study on June 6. The third seeding date experienced severe deer grazing pressure at bolting.

Table 1. Seeding rates to achieve target plant density.

Variety	Thousand Kernel Weight (g)	Target plant/sqft	Seeding rate (lb/A)
DKL 30-42	6.8	4	3.5
DKL 30-42	6.8	8	7.0
DKL 30-42	6.8	16	13.9
InVigor L130	6.1	4	3.1
InVigor L130	6.1	8	6.2
InVigor L130	6.1	16	12.5
HyClass 955	5.3	4	2.7
HyClass 955	5.3	8	5.4
HyClass 955	5.3	16	10.9

Estimated survival rate: 75%

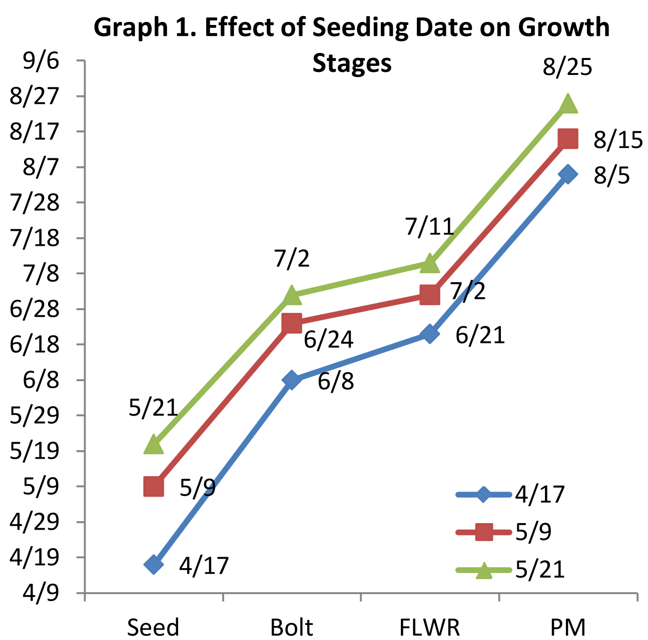
lb/A = (9.6 x plant/sqft x tkw)/75

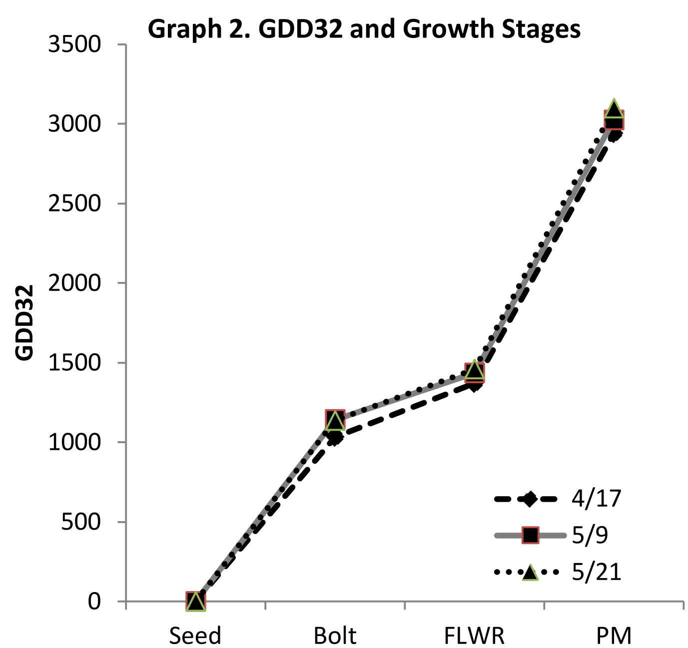
Results:

The main effect of variety had a significant effect on days to bolt, flower and physiological maturity, plants per square foot, percent lodging, height, percent oil, test weight and thousand kernel weights. DKL 30-42 and HyClass 955 were statistically equivalent and the required the least amount of days to bolt, flower and physiological maturity compared to InVigor L130. No statistical differences in yield were observed between varieties (Table 2).

Plant density impacted days to physiological maturity and lodging. As plant density increased, the rate of plant development increased and the degree of lodging increased (Table 3). However, lodging was minimal for InVigor L130, regardless of the plant density (Table 5). Of the treatment factors evaluated, the main effect of planting date had the most pronounced effect on canola growth and development (Table 4). Planting date impacted stand establishment. The second seeding date had the greatest percent survival and averaged 14 plants per square foot, regardless of targeted plant population. The third seeding date had the worse percent survival and averaged 4.6 plants per square foot.

Not surprisingly, crop development varied with planting date. The earlier planting provided for a longer growing season. As planting was delayed, the time interval between crop developmental stages became more compressed. That is, it took fewer days to reach maturity (Graph 1). However, planting date had no effect on crop developmental rates when expressed on a growing degree day basis (Graph 2).





FLWR: 50 % flower, PM: physiological maturity

Planting date had a significant impact on yield. Yields were similar for the first two seeding dates. However, yields declined dramatically with the third seeding date (Table 4).

Canola development varied by variety and seeding date (Table 6). All varieties displayed similar rates of development at the first seeding date. However, differences between varieties became more apparent as seeding was delayed, especially with the late maturing variety, InVigorL130. Interactions were observed between plant density and seeding date (Table 7) for plants per square foot, lodging, height, yield, and percent oil. The first seeding date achieved the targeted number of plants, while the second seeding date exceeded the target, and the third seeding date was significantly below the desired population. Yields declined as planting date was delayed, regardless of plant population. Eight plants per square foot at the first and second seeding dates afforded the highest yields at 58.3 bu/A and 53.3 bu/A respectively. The highest seeding rate produced the lowest yields at the first two seeding dates, but had the highest yields at the last seeding date.

Conclusion:

Seeding date and variety had the greatest impact on agronomic performance of canola, while plant population had minimal effect. Yield was considerably lower with the later seeding date and this may be attributed poor stand establishment, as well as adverse environmental conditions during flowering and pod filling. Further, the later seeding date was subject to severe deer grazing pressure at bolting. Overall, a mid-April to mid-May seeding date with a target plant population of four to eight plants per square foot appears to be the optimum conditions for canola production in northwestern Montana.

Table 2. Main effect of variety on agronomic performance of canola - 2013

Variety	BOLT Days	FLWR Days	BOLT to FLWR Days	PM Days	BOLT to PM Days	PLNT sqft	DWT g	LOD %	HT in	YLD bu/A	OIL %	TWT lb/bu	TKW %	MC %
DKL 30-42	45.8	55.7	9.9	100.9	55.1	8.0	231.5	19.3	50.0	40.9	47.5	49.6	4.5	9.7
HyClass 955	46.1	55.9	9.8	101.1	55.0	10.8	208.8	17.8	51.9	40.2	48.0	49.4	4.3	9.5
InVigor L130	48.5	57.8	9.3	102.9	54.4	10.2	228.1	5.3	56.6	40.5	45.7	50.2	3.9	11.6
LSD	0.7	1.7	2.0	1.4	1.8	1.8	64.1	7.0	4.6	2.7	0.8	0.6	0.3	1.3
Pr>F	0.0008	0.0517	0.7056	0.0301	0.5371	0.0240	0.6091	0.0097	0.0366	0.7715	0.0029	0.0405	0.0079	0.0198

Table 3. Main effect of plant density on agronomic performance of canola - 2013

4 plants/sqft	47.0	57.1	10.1	102.9	55.9	4.2	221.4	1.9	52.3	39.8	46.9	49.6	4.5	10.8
8 plants/sqft	46.7	56.6	9.8	101.7	55.0	9.1	238.8	6.2	54.1	42.6	47.1	49.8	4.2	10.2
16 plants/sqft	46.7	55.9	9.2	100.3	53.6	15.7	208.1	34.3	52.0	39.2	47.2	49.8	4.1	9.7
LSD	0.6	2.2	2.2	1.4	1.5	1.6	72.1	4.3	4.1	6.6	1.0	0.7	0.3	1.7
Pr>F	0.3699	0.3954	0.5672	0.0166	0.0328	0.0001	0.5475	0.0001	0.3839	0.3953	0.7036	0.7860	0.0617	0.3294

Table 4. Main effect of seeding date on agromomic performance of canola - 2013

4/17	52.2	64.8	12.6	110.4	58.2	10.3	296.9	24.4	54.4	55.1	48.7	50.3	3.5	11.1
5/9	46.4	54.1	7.7	98.2	51.8	14.0	244.5	18.0	56.6	50.1	47.6	49.3	4.6	9.7
5/21	41.9	50.6	8.8	96.4	54.6	4.6	126.9	0.0	47.4	16.4	44.9	49.6	4.7	9.9
LSD	1.4	3.6	3.9	1.6	2.9	3.0	81.5	9.3	4.4	7.6	1.0	0.6	0.4	1.8
Pr>F	0.0001	0.0009	0.0521	0.0001	0.0094	0.0024	0.0105	0.0043	0.0098	0.0003	0.0009	0.0270	0.0018	0.1638

Table 5. Effect of variety and density on agronomic performance of canola - 2013

Variety	BOLT Days	FLWR Days	BOLT to FLWR Days	PM Days	BOLT to PM Days	PLNT sqft	DWT g	LOD %	HT in	YLD bu/A	OIL %	TWT lb/bu	TKW %	MC %
						Four plants/sqft								
DKL 30-42	45.8	55.9	10.1	102.3	56.6	3.2	245.8	1.7	48.4	41.4	47.2	49.4	4.8	10.3
HyClass 955	46.2	56.0	9.8	101.4	55.2	4.9	189.6	2.8	51.8	39.1	48.3	49.1	4.4	9.2
InVigor L130	49.0	59.3	10.3	105.0	56.0	4.6	228.8	1.1	56.6	38.8	45.1	50.4	4.2	13.0
						Eight plants/sqft								
DKL 30-42	45.8	56.6	10.8	101.7	55.9	6.9	217.4	12.2	51.8	45.6	47.3	49.8	4.6	9.9
HyClass 955	46.1	56.1	10.0	101.1	55.0	9.9	232.1	5.0	52.6	43.4	48.0	49.3	4.3	9.6
InVigor L130	48.3	57.0	8.7	102.4	54.1	10.6	267.0	1.4	58.1	38.9	46.1	50.2	3.6	11.2
						Sixteen plants/sqft								
DKL 30-42	45.9	54.8	8.9	98.8	52.9	13.9	231.3	43.9	49.7	35.8	47.9	49.5	4.3	8.8
HyClass 955	46.0	55.7	9.7	100.9	54.9	17.7	204.7	45.6	51.4	38.2	47.8	49.8	4.2	9.8
InVigor L130	48.1	57.1	9.0	101.2	53.1	15.4	188.4	13.3	55.0	43.7	45.8	50.0	3.9	10.6
LSD	1.0	1.9	2.2	2.9	2.9	3.3	90.3	11.2	4.3	8.4	1.4	0.7	0.5	2.5
Pr>F	0.5686	0.1626	0.3852	0.3279	0.3747	0.5494	0.4713	0.0074	0.7783	0.1492	0.4280	0.1852	0.2022	0.3881

FLWR: flowering, PM: physiological maturity, PLNT: plants, DWT: dry weight, LOD: lodging, HT: height, YLD: yield, TWT: test weight, TKW: thousand kernel weight, MC: moisture

Table 6. Effect of variety and seeding date on agronomic performance of canola - 2013

Variety	BOLT Days	FLWR Days	BOLT to FLWR Days	PM Days	BOLT to PM Days	PLNT sqft	DWT g	LOD %	HT in	YLD bu/A	OIL %	TWT lb/bu	TKW %	MC %
					First seeding date - April 17									
DKL 30-42	52.1	65.1	13.0	110.8	58.7	9.6	328.7	27.2	53.0	54.4	49.0	50.3	3.7	11.0
HyClass 955	51.8	64.3	12.6	110.7	58.9	10.7	253.6	30.0	52.4	55.5	49.5	50.1	3.6	11.1
InVigor L130	52.7	64.9	12.2	109.7	57.0	10.8	308.4	15.9	57.9	55.5	47.6	50.3	3.2	11.3
					Second seeding date - May 9									
DKL 30-42	44.0	52.8	8.8	96.8	52.8	11.8	250.7	30.6	52.9	53.4	47.8	49.1	4.9	8.9
HyClass 955	45.4	54.2	8.8	98.0	52.6	15.4	231.4	23.3	56.8	46.6	48.4	48.8	4.6	8.9
InVigor L130	49.7	55.2	5.6	99.8	50.1	14.9	251.5	0.0	60.0	50.4	46.6	50.0	4.2	11.4
					Third seeding date - May 21									
DKL 30-42	41.3	49.3	8.0	95.2	53.9	2.7	115.1	0.0	44.0	15.1	45.6	49.3	5.0	9.1
HyClass 955	41.1	49.2	8.1	94.8	53.7	6.3	141.3	0.0	46.6	18.5	46.3	49.2	4.7	8.5
InVigor L130	43.1	53.3	10.2	99.2	56.1	4.9	124.4	0.0	51.8	15.5	42.8	50.3	4.3	12.1
LSD	1.0	1.8	2.1	1.6	1.9	3.0	82.2	7.1	2.9	7.6	0.9	0.7	0.6	1.4
Pr>F	0.0003	0.0252	0.0159	0.0030	0.0110	0.5959	0.4306	0.0010	0.2132	0.3156	0.0626	0.1393	0.9454	0.0332

Table 7. Effect of plant density and seeding date on agronomic performance of canola - 2013

Density	BOLT Days	FLWR Days	BOLT to FLWR Days	PM Days	BOLT to PM Days	PLNT sqft	DWT g	LOD %	HT in	YLD bu/a	OIL %	TWT lb/bu	TKW %	MC %
					First seeding date - April 17									
4 plants/sqft	52.8	65.4	12.7	111.7	58.9	4.2	288.9	4.4	54.0	56.2	48.5	50.2	3.5	11.5
8 plants/sqft	51.9	64.7	12.8	110.3	58.4	9.9	326.6	12.0	55.9	58.3	49.1	50.2	3.6	11.2
16 plants/sqft	51.9	64.2	12.3	109.1	57.2	16.9	275.1	56.7	53.4	50.9	48.5	50.4	3.4	10.7
					Second seeding date - May 9									
4 plants/sqft	46.6	54.3	7.8	99.0	52.4	6.0	240.5	1.1	58.3	50.5	47.9	49.4	5.0	10.5
8 plants/sqft	46.6	53.9	7.3	97.9	51.3	12.3	254.0	6.7	57.3	53.3	47.7	49.2	4.3	9.4
16 plants/sqft	46.0	54.0	8.0	97.7	51.7	23.8	239.1	46.1	54.0	46.5	47.2	49.4	4.3	9.3
					Third seeding date - May 21									
4 plants/sqft	41.7	51.4	9.8	98.1	56.4	2.4	134.7	0.0	44.4	12.6	44.3	49.3	4.8	10.5
8 plants/sqft	41.8	51.1	9.3	97.0	55.2	5.1	135.9	0.0	49.2	16.2	44.6	50.0	4.7	10.0
16 plants/sqft	42.1	49.3	7.2	94.1	52.0	6.3	110.2	0.0	48.7	20.3	45.8	49.4	4.5	9.2
LSD	1.3	1.8	1.7	3.3	3.6	1.5	73.6	8.6	3.4	6.2	0.5	0.6	0.4	1.9
Pr>F	0.4469	0.4699	0.1135	0.6830	0.4780	0.0001	0.8884	0.0001	0.0383	0.0367	0.0007	0.1908	0.0869	0.9330

FLWR: flowering, PM: physiological maturity, PLNT: plants, DWT: dry weight, LOD: lodging, HT: height, YLD: yield, TWT: test weight, TKW: thousand kernel weight, MC: moisture

Table 8. Effect of variety, seeding date and population density on agronomic performance of canola - 2013

Variety	BOLT Days	FLWR Days	BOLT to FLWR Days	PM Days	BOLT to PM Days	PLNT sqft	DWT g	LOD %	HT in	YLD bu/A	OIL %	TWT lb/bu	TKW %	MC %
First seeding date - four plants/sqft														
DKL 30-42	52.0	65.3	13.3	112.3	60.3	4.0	382.4	5.0	52.0	54.2	48.4	50.3	3.8	11.4
HyClass 955	52.7	64.7	12.0	112.0	59.3	4.3	227.0	5.0	52.3	54.1	49.8	50.0	3.5	11.0
InVigor L130	53.7	66.3	12.7	110.7	57.0	4.3	257.5	3.3	57.7	60.2	47.2	50.3	3.2	12.1
First seeding date - eight plants/sqft														
DKL 30-42	51.7	66.0	14.3	111.3	59.7	8.3	323.9	16.7	54.3	63.2	49.2	50.3	3.9	11.9
HyClass 955	51.7	63.3	11.7	109.7	58.0	10.7	276.5	15.0	52.7	59.6	49.6	49.8	3.7	10.5
InVigor L130	52.3	64.7	12.3	110.0	57.7	10.7	379.2	4.3	60.7	52.2	48.5	50.4	3.1	11.3
First seeding date - sixteen plants/sqft														
DKL 30-42	52.7	64.0	11.3	108.7	56.0	16.3	279.7	60.0	52.7	45.7	49.4	50.3	3.4	9.9
HyClass 955	51.0	65.0	14.0	110.3	59.3	17.0	257.4	70.0	52.3	53.0	49.1	50.6	3.7	11.7
InVigor L130	52.0	63.7	11.7	108.3	56.3	17.3	288.4	40.0	55.3	53.9	47.0	50.3	3.3	10.6
Second seeding date - four plants/sqft														
DKL 30-42	44.3	53.0	8.7	97.7	53.3	4.0	231.8	0.0	53.3	58.5	48.4	49.1	5.2	9.7
HyClass 955	45.3	54.7	9.3	97.7	52.3	7.0	192.8	3.3	59.0	48.0	49.2	48.5	4.9	8.0
InVigor L130	50.0	55.3	5.3	101.7	51.7	7.0	296.9	0.0	62.7	45.1	46.0	50.5	5.1	13.6
Second seeding date - eight plants/sqft														
DKL 30-42	44.0	52.7	8.7	97.0	53.0	10.3	240.4	20.0	54.7	57.4	47.8	49.0	4.8	8.3
HyClass 955	45.7	54.0	8.3	97.3	51.7	12.3	265.7	0.0	57.7	51.7	48.3	48.6	4.6	9.7
InVigor L130	50.0	55.0	5.0	99.3	49.3	14.3	256.1	0.0	59.7	50.9	47.1	49.8	3.5	10.3
Second seeding date - sixteen plants/sqft														
DKL 30-42	43.7	52.7	9.0	95.7	52.0	21.0	279.9	71.7	50.7	44.2	47.3	49.3	4.6	8.7
HyClass 955	45.3	54.0	8.7	99.0	53.7	27.0	235.7	66.7	53.7	40.0	47.6	49.4	4.3	9.1
InVigor L130	49.0	55.3	6.3	98.3	49.3	23.3	201.6	0.0	57.7	55.3	46.7	49.7	4.1	10.1
Third seeding date - four plants/sqft														
DKL 30-42	41.0	49.3	8.3	97.0	56.0	1.7	123.1	0.0	40.0	11.7	44.8	48.8	5.3	9.9
HyClass 955	40.7	48.7	8.0	94.7	54.0	3.3	148.9	0.0	44.0	15.2	46.0	48.7	4.9	8.4
InVigor L130	43.3	56.3	13.0	102.7	59.3	2.3	132.2	0.0	49.3	11.1	42.2	50.5	4.4	13.2
Third seeding date - eight plants/sqft														
DKL 30-42	41.7	51.0	9.3	96.7	55.0	2.0	88.0	0.0	46.3	16.2	44.9	50.2	5.1	9.5
HyClass 955	41.0	51.0	10.0	96.3	55.3	6.7	154.0	0.0	47.3	18.9	46.1	49.6	4.8	8.6
InVigor L130	42.7	51.3	8.7	98.0	55.3	6.7	165.7	0.0	54.0	13.4	42.6	50.3	4.1	12.0
Third seeding date - sixteen plants/sqft														
DKL 30-42	41.3	47.7	6.3	92.0	50.7	4.3	134.3	0.0	45.7	17.4	47.1	48.8	4.8	7.8
HyClass 955	41.7	48.0	6.3	93.3	51.7	9.0	120.9	0.0	48.3	21.5	46.7	49.3	4.6	8.6
InVigor L130	43.3	52.3	9.0	97.0	53.7	5.7	75.3	0.0	52.0	22.0	43.7	50.2	4.3	11.2
LSD	1.4	3.2	3.9	2.9	3.2	4.4	116.4	10.1	6.0	10.1	1.5	1.4	0.7	3.0
Pr>F	0.3101	0.2692	0.4303	0.3264	0.4551	0.8871	0.3701	0.0001	0.9730	0.2255	0.5567	0.9026	0.5194	0.7500

FLWR: flowering, PM: physiological maturity, PLNT: plants, DWT: dry weight, LOD: lodging, HT: height, YLD: yield, TWT: test weight, TKW: thousand kernel weight, MC: moisture

Project Title:	Statewide Canola Variety Trial – 2013
Project Leader:	Brooke Bohannon
Project Personnel:	Bob Stougaard
Objective:	To evaluate canola varieties for agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

Twenty-one canola entries were evaluated this year in Creston: 18 true canola, two canola quality mustards (VT X121 CL and VT Oasis CL), and one high erucic acid industrial rapeseed (Gem). DKL 30-42, Cara, and Arriba were included as check varieties.

Plants per square foot averaged 15 and ranged from 7.8 to 20.8. Flea beetle damage was observed this year and the study was rated for damage at the 4-6 leaf stage on June 3. On a scale of 1 – 10, damage averaged 1.2, with 10 being severe. VT X121 CL and VT Oasis CL had flea beetle damage ratings of 6.3 and 5.5, respectively. Average days to flowering were 180.8 (June 30), ranging from 178 to 184 days. Average days to maturity were 225 (August 13), ranging from 222 to 228 days. Plant height averaged 59.9 inches and ranged from 53.3 inches for DKL 30-03 to 67.5 inches for VT X121 CL. Lodging averaged 48.9 % and ranged from 6.3 % for Nexera 2012 CL to 93.8 % for Arriba. The average yield was 2,108.7 lb/A, ranging from 1,016.1 lb/A for Arriba to 3,165.5 lb/A for Invigor 5440. Invigor L130 yielded statistically equivalent to Invigor 5440. Oil content averaged 46.4 %, ranging from 43.6 % to 48.8 %. Test weights averaged 48.3 lb/bu, ranging from 46.4 lb/bu to 49.7 lb/bu. No significant difference was observed in percent shatter.

Table 1. Materials and Methods - Canola variety trial - 2013

Seeding Date:	5/2/13	Soil Type:	Creston Sil
Julian Date:	122	Soil Test:	202-6-162-38
Seeding Rate:	10 plants/sqft	Fertilizer:	0-40-40-20
Previous Crop:	Spring Wheat	Pesticide:	NA
Tillage:	Conventional	Harvest Date:	8/26/13
Irrigation:	None	Julian Date:	238

Table 2. Agronomic data from the statewide canola variety trial, Kalispell, MT - 2013

Cultivar	PLNT sqft	FB 0—10	FLWR Julian	HT in	LOD %	SHTTR %	PM Julian	YLD lb/A	YLD bu/A	OIL %	TWT lb/bu
Invigor 5440	17.5	0.5	184	65.8	22.5	5.0	226	3165.5	63.3	45.9	48.9
Invigor L130	15.8	1.3	183	64.0	7.5	2.5	225	2803.4	56.1	46.1	48.8
HyClass 930	14.8	0.8	179	53.5	60.0	0.5	224	2641.5	52.8	48.1	47.7
Pioneer 45H29	13.5	0.6	183	66.5	31.3	1.3	227	2574.6	51.5	46.2	48.4
HyClass 955	14.5	0.5	178	60.0	78.0	0.0	223	2470.0	49.4	47.8	48.3
DKL 70-07	17.0	0.4	182	56.5	63.8	0.0	225	2431.8	48.6	46.4	48.3
Invigor L156H	13.8	0.6	184	62.8	22.5	2.5	228	2414.7	48.3	47.3	46.4
DKL 55-55	17.3	0.5	179	59.3	42.5	0.8	224	2388.4	47.8	48.5	47.9
InVigor L120	12.3	0.8	183	62.8	28.8	3.3	225	2335.1	46.7	45.9	47.5
DKL 30-42	11.5	0.5	178	53.5	65.0	2.5	222	2295.6	45.9	47.1	48.5
DKL 30-03	15.3	0.5	178	53.3	66.3	1.3	223	2115.3	42.3	48.3	48.3
HyClass 969	18.3	1.0	182	57.5	58.8	0.0	225	2099.9	42.0	47.3	47.8
6070 RR	17.0	0.9	183	62.5	60.0	0.0	227	2048.3	41.0	46.4	48.9
DKL 38-48	18.3	0.8	182	55.0	60.0	0.0	224	2024.9	40.5	45.7	48.4
Nexera 2012CL	10.8	0.6	183	61.8	6.3	5.0	226	1935.1	38.7	47.1	48.4
VT X121 CL	15.5	6.3	180	67.5	18.8	3.3	226	1825.9	36.5	44.6	49.7
VT Oasis CL	20.8	5.5	178	61.5	33.8	1.3	226	1500.7	30.0	43.7	49.2
Cara	7.8	0.9	183	62.0	41.3	5.0	226	1462.4	29.2	45.3	48.5
Idaho Zephyr	14.3	0.7	181	59.0	88.8	1.3	225	1393.5	27.9	43.6	49.5
Gem	11.8	0.9	180	57.8	77.5	2.5	224	1339.5	26.8	48.8	48.0
Arriba	17.8	0.6	179	56.0	93.8	0.0	224	1016.1	20.3	43.8	48.1
Mean	15.0	1.2	180.8	59.9	48.9	1.8	224.9	2108.7	42.2	46.4	48.3
CV	30.4	54.5	0.6	6.9	37.7	151.2	0.52	15.0	15.0	1.8	0.8
LSD (P=.05)	6.4	0.9	1.6	5.9	26.0	3.8	1.67	446.7	8.9	1.2	0.5
Pr>F	0.0404	0.0001	0.0001	0.0001	0.0001	0.0742	0.0001	0.0001	0.0001	0.0001	0.0001

PLNT: plant, FB: flea beatle damage, FLWR: 50% flowering, HT: height, LOD: lodging, SHTTR: shatter, PM: physiological maturity, YLD: yield, TWT: test weight

PULSES

Project Title: Lentil Variety Evaluation – 2013

Project Leader: Brooke Bohannon

Project Personnel: Chengci Chen

Objective: To evaluate the agronomic performance of lentil cultivars in northwestern Montana.

Results:

Eight cultivars were seeded on May 17 as a randomized complete block design using four replications.

Significant differences were observed among varieties for each of the agronomic traits (Table 2). Yields averaged 22.5 bu/A, ranging from 30.3 bu/A for CDC Redberry to 16.5 bu/A for Imi-Green. Test weights averaged 55.7 lb/bu, and ranged from 58.4 lb/bu for Viceroy to 53.1 lb/bu for CDC Greenland. CDC Redberry had a height of 22.1 inches, which was significantly taller than all other varieties, which averaged 17.7 inches.

Overall, CDC Redberry, a red-Turkish seed variety, performed better than the other varieties in regards to yield. It took 74 days to flower compared to 75 days for Viceroy, the next highest yielding variety. Viceroy is a small green seed variety that is shorter in height than average, but with the highest test weight of all the varieties. CDC Greenland is a large green seed variety with an average yield, the lowest test weight, but with the highest thousand kernel weight.

Table 1. Materials and Methods - Lentil variety trial - 2013

Seeding Date:	4/17/13	Soil Type:	Creston Sil
Julian Date:	107	Soil Test:	301-16-288
Seeding Rate:	NA	Fertilizer:	0-20-35
Previous Crop:	Winter Wheat	Pesticide:	NA
Tillage:	Conventional	Harvest Date:	9/11/13
Irrigation:	None	Julian Date:	254

Table 2. Lentil agronomic analysis – 2013

Cultivar		FLWR	HT PF 7/15	HT PM 7/29	YLD	YLD	TWT	TKW
		Julian	———in———		lb/A	bu/A	lb/bu	g
CDC Redberry	Red-Turkish	181	22.1	8.0	1816.0	30.3	57.3	41.0
Viceroy	Small Green	182	15.9	7.0	1496.2	24.9	58.4	34.2
CDC Greenland	Large Green	182	16.5	8.0	1379.2	23.0	53.1	56.1
Impress CL	Med. Green	182	15.4	9.5	1309.8	21.8	54.9	45.2
CDC Richlea	Med. Green	183	18.3	8.0	1303.2	21.7	54.1	48.3
Avondale (2300R)	Med. Green	181	19.3	9.0	1244.9	20.7	56.1	44.3
Crimson	Small Red	181	16.6	7.5	1238.2	20.6	58.2	33.4
Imi-Green	Med. Green	181	17.4	11.0	990.2	16.5	53.9	49.3
Mean		181.6	17.7	8.5	1347.2	22.5	55.7	44.0
CV		0.5	10.7	12.4	14.1	14.1	1.7	5.3
LSD		1.2	2.8	1.6	279.7	4.7	1.4	3.4
Pr>F		0.0374	0.0011	0.0007	0.0005	0.0005	0.0001	0.0001

Footnotes: FLWR: 50% flowering, HT PF: height at pod fill, HT PM: height at physiological maturity, YLD: Yield, TWT: test weight, TKW: thousand kernel weight

Project Title:	Pea Variety Evaluation - 2013
Project Leader:	Brooke Bohannon
Project Personnel:	Chengci Chen
Objective:	To evaluate seed yield and agronomic performance of nineteen pea cultivars in northwestern Montana.

Results:

Yellow pea yields averaged 4,404.6 lb/A (Table 2.), ranging from 4,938.0 lb/A for DS Admiral to 3,710.7 lb/A for Jetset. CDC Treasure, CDC Meadow, Universal and Navarro all yielded statistical equivalent to DS Admiral. Pea leaf weevil (PLW) infestation was high this year. On a scale of 1-10, damage averaged 5.4, with 10 being complete defoliation. Agassiz had a PLW rating of 10, maturity was severely delayed and consequently plots were not harvested. Average days to flowering were 177 (June 26) with Navarro being the earliest at 172 days. CDC Meadow, Universal, Delta and SW Midas were the first to reach physiological maturity at 218 days (August 6). Canopy height at physiological maturity averaged 14.4 inches, test weight averaged 63.8 lb/bu, and thousand kernel weights averaged 200.9g.

Green pea yields varied, with Arcadia yielding the highest at 4,700.9 lb/A (Table 3.). Daytona and Majoret yielded statistically equivalent to Arcadia. Aragorn was the earliest flowering, yet no differences in physiological maturity were observed. Thousand kernel weights averaged 197.6 g. No significant difference was observed in PLW damage, height at pod fill, height at maturity, physiological maturity or test weight.

Table 1. Materials and Methods - Statewide pea variety trial - 2013

Seeding Date:	4/17/13	Soil Type:	Creston Sil
Julian Date:	107	Soil Test:	301-16-288
Seeding Rate:	7.5 plants/sqft	Fertilizer:	0-20-35
Previous Crop:	Winter Wheat	Pesticide:	NA
Tillage:	Conventional	Harvest Date:	8/14/13
Irrigation:	None	Julian Date:	226

Table 2. Yellow pea agronomic data -2013

Cultivar	PLW 0-10	FLWR Julian	HT PD in	HT PM in	PM Julian	YLD lb/A	YLD bu/A	TWT lb/bu	TKW g
DS Admiral	5.3	178	41.9	11.6	220	4938.0	82.3	63.4	214.1
CDC Treasure	5.0	179	44.4	15.0	220	4871.3	81.2	65.0	189.2
CDC Meadow	4.9	178	46.8	17.1	218	4647.2	77.5	64.4	174.5
Universal	5.0	173	39.3	12.8	218	4632.7	77.2	63.3	197.8
Navarro	5.0	172	45.7	13.3	219	4493.6	74.9	63.3	231.0
Spider	5.0	180	41.3	14.5	221	4439.7	74.0	64.3	198.9
Bridger (LL7020)	4.8	177	43.4	17.3	219	4440.2	74.0	64.2	201.3
Montech 4152	5.0	176	46.9	18.0	220	4345.6	72.4	64.3	213.6
Delta	5.0	176	39.7	10.3	218	4019.2	67.0	62.8	194.5
SW Midas	5.0	178	41.4	11.1	218	3911.8	65.2	62.9	179.5
Jetset	5.0	180	44.5	11.8	219	3710.7	61.8	64.1	215.3
Agassiz	10.0	186	25.8	19.6	na	na	na	na	na
Mean	5.4	177.4	41.7	14.4	218.9	4404.6	73.4	63.8	200.9
CV	3.9	0.3	11.2	20.3	0.6	7.3	7.3	1.0	3.9
LSD	0.3	0.8	6.7	4.2	1.7	467.2	7.8	0.9	11.2
Pr>F	0.0001	0.0001	0.0001	0.0004	0.0200	0.0001	0.0001	0.0003	0.0001

PLW: pea leaf weevil, FLWR: 50% flower, HT PD: height at pod fill, HT PM: height at physiological maturity, PM: physiological maturity, YLD: yield, TWT: test weight, TKW: thousand kernel weight

Table 3. Green pea agronomic data - 2013

Cultivar	PLW 0-10	FLWR Julian	HT PD in	HT PM in	PM Julian	YLD lb/A	YLD bu/A	TWT lb/bu	TKW g
Arcadia	4.9	179	39.8	12.3	217	4700.9	78.4	62.7	187.0
Daytona	4.9	180	42.2	12.0	219	4455.1	74.3	63.2	231.9
Majoret	4.9	179	44.8	12.8	218	4332.0	72.2	62.9	199.6
Aragorn	4.8	176	39.7	13.0	218	4033.9	67.3	62.2	182.8
K2	5.0	179	39.9	12.9	220	3418.0	57.0	62.8	197.0
CDC Striker	4.9	180	43.0	12.3	218	3390.6	56.5	63.3	206.5
Cruiser	5.0	177	44.9	11.8	218	3149.6	52.5	62.4	179.2
Mean	4.9	178.4	42.0	12.4	218.3	3907.4	65.1	62.8	197.6
CV	5.2	0.3	10.1	13.6	0.6	10.8	10.8	1.0	5.3
LSD	0.4	0.9	6.3	2.5	1.9	644.3	10.7	1.0	15.9
Pr>F	0.8324	0.0001	0.3576	0.9213	0.1879	0.0003	0.0003	0.2252	0.0001

PLW: pea leaf weevil, FLWR: 50% flower, HT PD: height at pod fill, HT PM: height at physiological maturity, PM: physiological maturity, YLD: yield, TWT: test weight, TKW: thousand kernel weight