

Northwestern Agricultural Research Center
of the
Department of Research Centers
Montana Agricultural Experiment Station
Montana State University
Seventy-Seventh Annual Report

ANNUAL REPORT 2025 CROP YEAR

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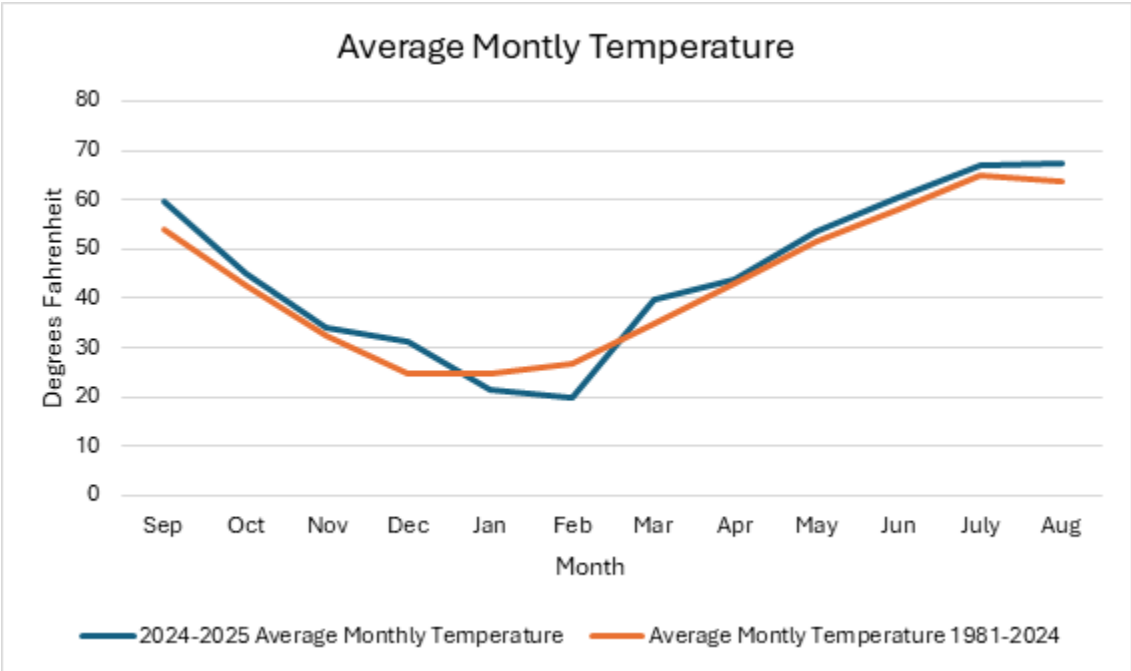
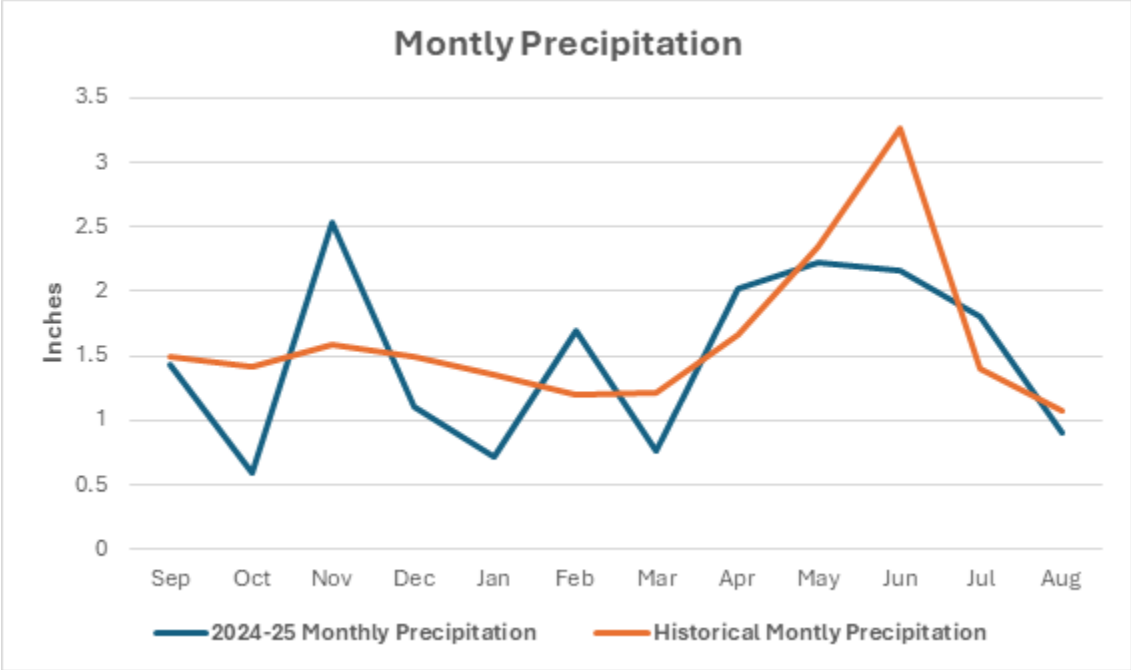
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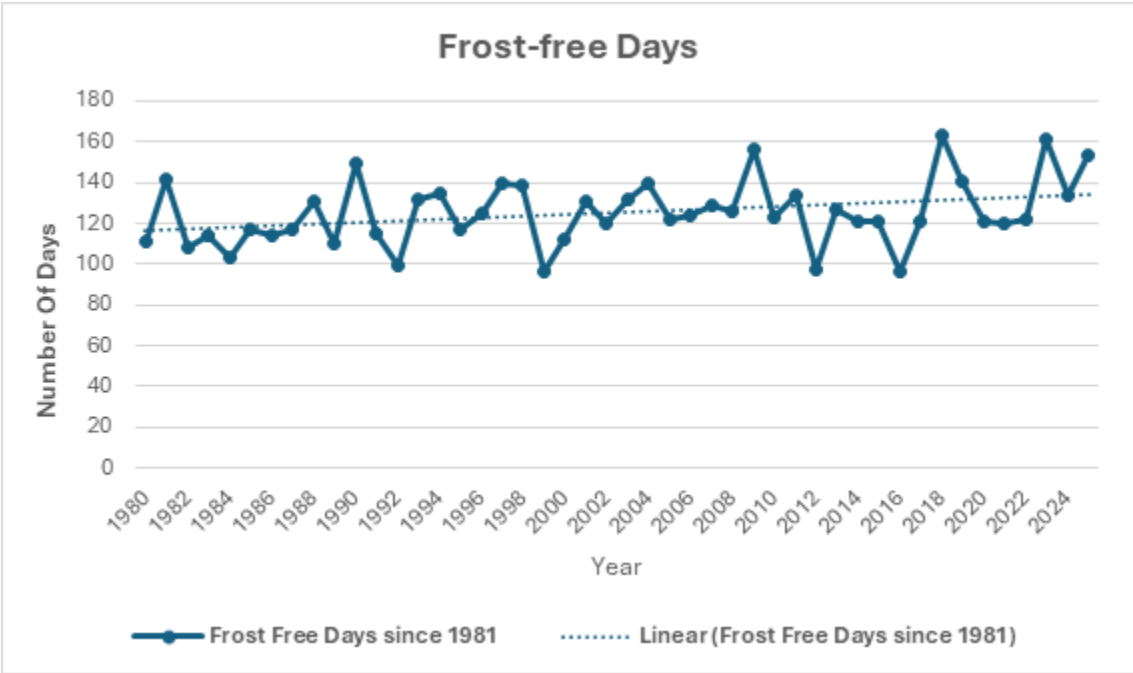
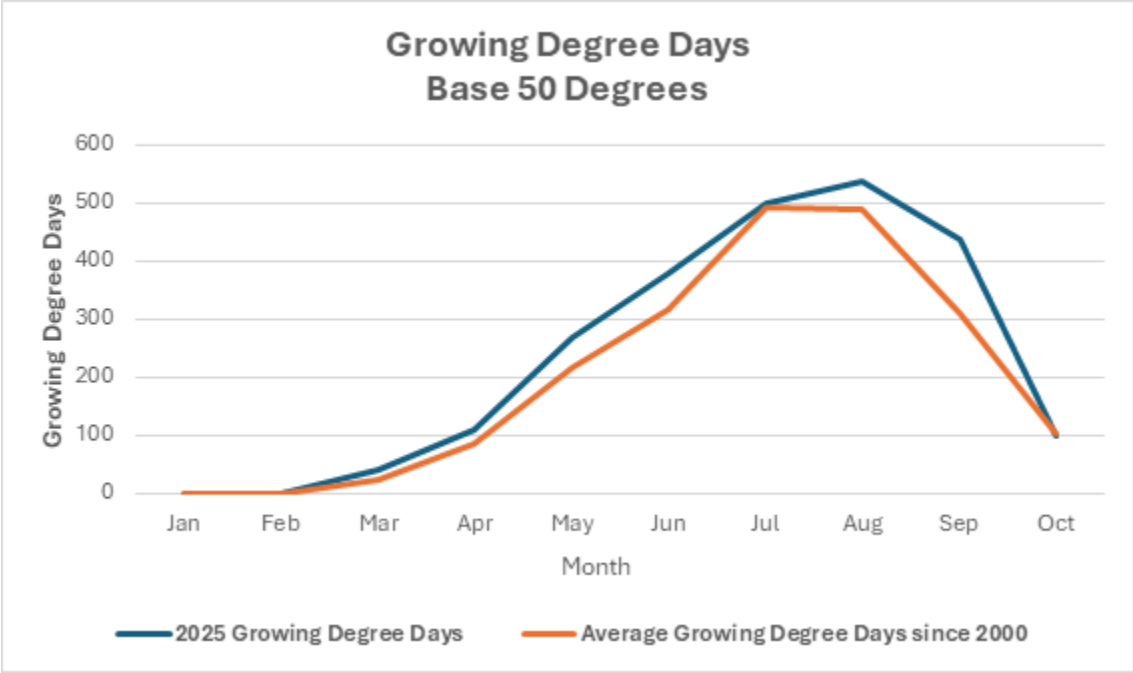
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CLIMATOLOGY

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





Summary of Climatic Data for the 2025 Crop Year: September 2024 – August 31, 2025
Northwestern Agricultural Research Center, Creston, Montana

Month	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	
Year	2024	2024	2024	2024	2025	2025	2025	2025	2025	2025	2025	2025	
Precipitation													Total
(in.)													
Current Year	1.44	0.6	2.54	1.10	0.71	1.69	0.77	2.03	2.22	2.17	1.80	0.9	17.97
Average (1981-2024)	1.50	1.42	1.59	1.50	1.36	1.20	1.21	1.66	2.35	3.27	1.40	1.08	19.52
Difference	-0.06	-0.82	0.95	-0.40	-0.65	0.49	-0.44	0.37	-0.13	-1.10	0.40	-0.18	-1.55
Mean													Average
Temperature													
Current Year	59.8	45.0	34.2	31.4	21.4	20.0	39.6	43.7	53.6	60.6	66.8	53.6	44.1
Average (1988-2024)	54.1	42.5	32.6	24.6	24.6	26.6	34.8	42.9	51.6	57.9	64.8	63.9	43.4
Difference	5.7	2.5	1.6	6.8	-3.2	-6.6	4.8	0.8	2.0	2.7	2.0	-10.3	0.7

Last killing frost in Spring*

Spring 2025: May 6th (31°F)

Average (1980-2024): May 1st (30°F)

First killing frost in Fall*

Fall 2025: October 6th (28°F)

Average (1980-2024): September 19th (30°F)

Frost-free period

2025: 153 days

Average (1980-2024): 125 days

Maximum summer temperature: 93°F (Aug 30th; September 3rd, 2025)

Minimum winter temperature: -19°F (February 12th, 2025)

Growing Degree Days April-August 2025

	April	May	June	July	Aug	Total
Base 50	109.0	269.5	378.0	500.0	536.5	1793.0
Base 40	243.0	456.0	619.5	779.5	797.0	2895.0
Base 32	385.0	672.0	855.0	1019.5	1037.0	3968.5

Average GDD Base 50 from 2015-2025: 1683.8

*32 °F is considered a killing frost

**Summary of Temperature Data at the Northwestern Agricultural Research Center
On a Crop Year Basis September 1980 - August 31, 2025
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
2013-14	57.2	39.6	31.4	21.9	26.6	17.1	33.2	42.3	51.8	55.9	66.6	65.1	42.4
2014-15	54.2	48.0	28.8	25.0	22.6	32.4	38.6	43.6	52.7	63.7	65.7	64.3	45.0
2015-16	52.8	46.6	31.2	27.4	27.0	33.2	37.2	47.8	51.4	58.4	62.6	62.7	44.9
2016-17	52.0	43.5	38.4	17.3	12.5	22.1	35.8	40.4	52.6	59.6	68.0	64.3	42.2
2017-18	54.0	41.4	35.4	28.9	33.8	26.6	37.0	43.6	58.4	59.7	66.3	65.5	45.9
2018-19	55.5	44.7	37.3	29.0	25.6	11.3	25.5	43.9	53.5	59.4	63.4	64.8	42.8
2019-20	56.1	37.4	30.8	31.2	28.8	30.4	34.3	40.6	50.5	57.8	63.3	65.5	43.9
2020-21	55.9	41.0	34.1	28.1	29.5	19.7	36.6	42.4	50.0	62.4	70.5	64.8	44.6
2021-22	55.2	44.3	35.3	24.5	22.8	25.0	37.6	36.9	48.9	57.2	67.7	69.4	43.7
2022-23	58.5	48.2	24.5	18.2	24.8	24.4	29.2	42.0	58.8	61.4	67.7	67.3	43.8
2023-24	56.6	44.3	32.4	28.9	18.8	27.7	35.8	44.6	50.0	57.5	68.6	64.0	44.1
2024-25	59.8	45.0	34.2	31.4	21.4	20.0	39.6	43.7	53.6	60.6	66.8	67.3	45.3
MEAN	54.1	42.5	32.6	24.6	24.6	26.6	34.8	42.9	51.6	57.9	64.9	63.9	43.4
Mean temperature for all years =									43.4				

Precipitation by Day for Crop Year September 2024- August 2025 (inches)
Northwest Agriculture Research Center, Kalispell Montana

DAY	SEPT. 2024	OCT. 2024	NOV. 2024	DEC. 2024	JAN. 2025	FEB. 2025	MAR. 2025	APR. 2025	MAY 2025	JUNE 2025	JULY 2025	AUG. 2025
1	0.00	0.00	0.13	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00
2	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.12	0.00	0.03	0.00	0.06
3	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.62
4	0.00	0.00	0.19	0.00	0.50	0.00	0.00	0.10	0.22	0.00	0.00	0.00
5	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
8	0.00	0.00	0.00	0.06	0.09	0.00	0.00	0.01	0.00	0.00	0.00	0.04
9	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.01	0.00
12	0.35	0.00	0.04	0.00	0.00	0.00	0.00	0.11	0.29	0.32	0.00	0.00
13	0.76	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.13	0.23	0.00	0.00
14	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.15	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.14	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.24	0.00	0.08	0.00
17	0.00	0.07	0.04	0.01	0.00	0.00	0.00	0.10	0.11	0.00	0.00	0.12
18	0.08	0.04	0.00	0.19	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00
19	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.47	0.00	0.00	0.00
20	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00
21	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.05	0.84	0.01	0.00
22	0.00	0.48	0.90	0.00	0.00	0.00	0.00	0.00	0.01	0.45	0.16	0.00
23	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.03	0.29	0.64	0.00
24	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.01	0.00	0.06	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
30	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.29	0.18	0.00	0.00	0.00
31		0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	1.44	0.60	2.54	1.10	0.71	1.69	0.77	2.03	2.22	2.17	1.80	0.90

Year
to
date

inches
17.97

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

Total Precipitation in Inches by Year and Month

YEAR	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	TOTAL
1980-81	1.20	0.83	0.78	2.58	1.81	1.85	2.17	1.75	3.86	4.70	1.17	0.96	23.66
1981-82	0.77	0.56	1.49	1.91	2.38	1.48	1.16	1.60	1.25	2.41	2.06	1.17	18.24
1982-83	2.37	0.75	1.39	1.60	0.93	0.85	1.71	2.41	1.20	2.96	3.66	1.16	20.99
1983-84	1.70	1.13	1.96	2.57	0.80	2.19	1.81	1.93	2.91	2.07	0.31	0.55	19.93
1984-85	2.15	2.25	1.40	1.29	0.31	1.28	0.90	1.31	2.81	1.89	0.35	1.62	17.56
1985-86	5.35	1.55	1.61	0.51	2.39	2.33	0.50	1.34	2.92	1.83	2.09	0.81	23.23
1986-87	3.63	0.80	1.78	0.63	0.38	0.46	3.47	1.15	1.89	1.95	4.85	0.98	21.97
1987-88	0.81	0.12	0.91	1.18	0.98	1.03	0.77	1.36	3.60	1.98	1.07	0.13	13.94
1988-89	2.30	0.62	1.39	1.69	1.39	1.48	2.29	1.09	2.70	2.05	2.70	3.69	23.39
1989-90	1.50	2.29	3.75	1.92	0.96	1.00	1.76	1.63	3.74	2.68	2.34	2.44	26.01
1990-91	T	2.32	1.37	2.60	1.41	0.41	0.72	1.21	2.72	5.36	0.77	1.15	20.04
1991-92	0.80	0.75	2.26	0.58	1.17	0.61	0.83	1.18	1.65	5.34	2.24	0.94	18.35
1992-93	1.21	1.07	2.37	1.53	1.68	0.60	0.73	3.77	2.22	4.00	7.00	1.19	27.37
1993-94	1.54	0.83	1.23	1.27	1.43	1.49	0.11	2.01	1.79	2.59	0.10	0.23	14.62
1994-95	0.46	2.12	1.89	1.07	1.17	0.90	2.33	2.25	1.44	5.63	1.91	1.47	22.64
1995-96	1.21	2.75	2.33	1.91	2.22	1.18	1.19	3.32	4.58	2.05	0.95	0.80	24.49
1996-97	2.67	1.58	3.99	3.52	1.50	1.62	1.18	1.69	2.62	3.41	0.99	1.94	26.71
1997-98	2.36	0.94	0.33	0.42	0.77	0.33	2.64	1.80	5.14	4.64	1.18	0.72	21.27
1998-99	1.48	0.71	1.11	1.47	1.05	1.18	0.90	0.55	1.32	2.74	1.63	1.93	16.07
1999-00	0.36	1.72	2.33	1.08	1.46	1.81	1.30	2.21	0.89	1.80	0.84	0.35	16.15
2000-01	1.40	1.23	0.62	1.23	0.75	1.54	1.03	2.62	0.57	3.29	0.91	0.54	15.73
2001-02	0.32	1.80	1.44	0.59	1.21	1.66	1.48	0.91	2.72	2.39	1.45	1.44	17.41
2002-03	1.18	0.25	0.87	1.67	1.63	1.01	2.32	2.23	1.78	1.57	0.05	0.35	14.91
2003-04	2.56	1.29	0.59	1.04	2.02	0.42	0.57	2.23	1.97	1.31	1.24	3.60	18.84
2004-05	1.89	1.62	0.84	1.49	1.38	0.01	1.41	2.21	1.73	8.44	0.26	0.56	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
2013-14	2.65	0.36	2.00	0.99	1.36	1.66	2.32	0.76	1.17	6.39	0.51	1.73	21.90
2014-15	0.75	2.13	2.84	2.66	2.52	1.04	1.43	0.30	0.43	1.02	0.63	0.19	15.94
2015-16	0.96	0.79	1.00	2.16	1.42	1.01	0.97	1.50	2.78	2.07	1.55	1.11	17.32
2016-17	0.97	5.48	1.06	1.66	0.84	2.80	2.99	2.33	0.71	2.62	0.07	0.19	21.72
2017-18	0.99	1.28	1.69	2.98	1.17	2.14	0.42	1.54	1.78	2.63	0.30	0.22	17.14
2018-19	0.59	1.17	1.52	0.46	1.37	1.79	0.98	1.19	1.63	1.96	1.12	0.65	14.43
2019-20	2.50	1.12	0.90	0.48	1.59	0.61	0.10	1.53	3.44	5.39	1.22	0.41	19.29
2020-21	0.36	2.73	1.84	0.85	0.77	1.76	0.19	1.04	3.68	2.12	0.19	1.82	17.35
2021-22	1.01	1.52	1.46	1.46	0.74	0.54	1.55	0.81	1.14	6.20	0.56	0.17	17.16
2022-23	1.35	1.06	1.49	1.88	0.74	0.68	0.19	0.50	2.11	0.93	0.08	3.08	14.09
2023-24	0.79	0.76	2.27	0.70	1.97	0.84	0.44	1.12	3.44	1.42	2.27	1.43	17.45
2024-25	1.44	0.60	2.54	1.10	0.71	1.69	0.77	2.03	2.22	2.17	1.80	0.90	17.97
MEAN	1.50	1.42	1.59	1.50	1.36	1.20	1.21	1.66	2.35	3.27	1.40	1.08	19.52
	SEPT	OCT	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	TOTAL

Mean monthly precipitation for all crop years = 1.63 inches

**YEAR 2025 - GROWING DEGREE DAYS JANUARY THROUGH OCTOBER
CALCULATED AT BASE 50, BASE 40, AND BASE 32**

Page 2: June - October

Day	Temperatures		Growing Degree Days		
	MAX	MIN	Base 50	Base 40	Base 32
1	86	55	20.5	30.5	38.5
2	71	42	10.5	16.5	24.5
3	63	35	6.5	11.5	17.0
4	64	38	7.0	12.0	19.0
5	70	39	10.0	15.0	22.5
6	74	47	12.0	20.5	28.5
7	74	47	12.0	20.5	28.5
8	83	49	16.5	26.0	34.0
9	80	46	15.0	23.0	31.0
10	89	51	18.5	28.5	36.5
11	87	49	18.0	27.5	35.5
12	87	55	20.5	30.5	38.5
13	73	45	11.5	19.0	27.0
14	72	54	13.0	23.0	31.0
15	76	44	13.0	20.0	28.0
16	77	42	13.5	19.5	27.5
17	82	49	16.0	25.5	33.5
18	80	46	15.0	23.0	31.0
19	81	49	15.5	25.0	33.0
20	77	49	13.5	23.0	31.0
21	65	46	7.5	15.5	23.5
22	50	41	0.0	5.5	13.5
23	57	44	3.5	10.5	18.5
24	63	39	6.5	11.5	19.0
25	75	47	12.5	21.0	29.0
26	79	51	15.0	25.0	33.0
27	78	57	17.5	27.5	35.5
28	72	53	12.5	22.5	30.5
29	71	46	10.5	18.5	26.5
30	79	45	14.5	22.0	30.0

AV	AV	Total	Total	Total
MAX	MIN	Base 50	Base 40	Base 32
74.5	46.7	378.0	619.5	855.0

Day	Temperatures		Growing Degree Days		
	MAX	MIN	Base 50	Base 40	Base 32
1	87	49	18.0	27.5	35.5
2	91	51	18.5	28.5	36.5
3	92	62	24.0	34.0	42.0
4	84	44	17.0	24.0	32.0
5	77	53	15.0	25.0	33.0
6	63	45	6.5	14.0	22.0
7	78	48	14.0	23.0	31.0
8	83	50	16.5	26.5	34.5
9	92	56	21.0	31.0	39.0
10	87	62	24.0	34.0	42.0
11	77	47	13.5	22.0	30.0
12	79	51	15.0	25.0	33.0
13	89	54	20.0	30.0	38.0
14	90	62	24.0	34.0	42.0
15	89	52	19.0	29.0	37.0
16	63	41	6.5	12.0	20.0
17	76	47	13.0	21.5	29.5
18	82	48	16.0	25.0	33.0
19	85	58	21.5	31.5	39.5
20	76	47	13.0	21.5	29.5
21	81	55	18.0	28.0	36.0
22	66	55	10.5	20.5	28.5
23	67	53	10.0	20.0	28.0
24	77	47	13.5	22.0	30.0
25	85	52	18.5	28.5	36.5
26	88	54	20.0	30.0	38.0
27	87	48	18.0	27.0	35.0
28	86	51	18.5	28.5	36.5
29	83	48	16.5	25.5	33.5
30	89	55	20.5	30.5	38.5
31	90	55	20.5	30.5	38.5

AV	AV	Total	Total	Total
MAX	MIN	Base 50	Base 40	Base 32
81.9	52	500.0	779.5	1019.5

Day	Temperatures		Growing Degree Days		
	MAX	MIN	Base 50	Base 40	Base 32
1	91	60	25.5	33.0	41.0
2	84	58	21.0	31.0	39.0
3	74	54	14.0	24.0	32.0
4	79	49	14.5	24.0	32.0
5	79	57	18.0	28.0	36.0
6	80	48	15.0	24.0	32.0
7	78	56	17.0	27.0	35.0
8	71	50	10.5	20.5	28.5
9	65	52	8.5	18.5	26.5
10	79	53	16.0	26.0	34.0
11	85	54	19.5	29.5	37.5
12	90	56	23.0	31.0	39.0
13	93	51	22.0	28.5	36.5
14	91	56	23.5	31.0	39.0
15	85	47	17.5	26.0	34.0
16	83	56	19.5	29.5	37.5
17	73	46	11.5	19.5	27.5
18	80	46	15.0	23.0	31.0
19	87	49	18.5	27.5	35.5
20	90	53	21.5	29.5	37.5
21	87	47	18.5	26.5	34.5
22	84	49	17.0	26.5	34.5
23	84	45	17.0	24.5	32.5
24	87	49	18.5	27.5	35.5
25	90	47	20.0	26.5	34.5
26	93	51	22.0	28.5	36.5
27	90	55	22.5	30.5	38.5
28	91	57	24.0	31.5	39.5
29	66	56	11.0	21.0	29.0
30	79	47	14.5	23.0	31.0
31	86	47	18.0	26.5	34.5

AV	AV	Total	Total	Total
MAX	MIN	Base 50	Base 40	Base 32
83.0	51.6	536.5	797.0	1037.0

Day	Temperatures		Growing Degree Days		
	MAX	MIN	Base 50	Base 40	Base 32
1	91	50	18.0	28.0	36.0
2	90	48	18.0	27.0	35.0
3	93	50	18.0	28.0	36.0
4	90	49	18.0	27.5	35.5
5	78	47	14.0	22.5	30.5
6	79	45	14.5	22.0	30.0
7	84	50	17.0	27.0	35.0
8	85	56	20.5	30.5	38.5
9	77	43	13.5	20.0	28.0
10	76	44	13.0	20.0	28.0
11	82	54	18.0	28.0	36.0
12	83	53	18.0	28.0	36.0
13	77	48	13.5	22.5	30.5
14	76	48	13.0	22.0	30.0
15	76	53	14.5	24.5	32.5
16	66	48	8.0	17.0	25.0
17	75	45	12.5	20.0	28.0
18	80	42	15.0	21.0	29.0
19	79	43	14.5	21.0	29.0
20	82	43	16.0	22.5	30.5
21	84	41	17.0	22.5	30.5
22	63	42	6.5	12.5	20.5
23	67	35	8.5	13.5	19.0
24	73	37	11.5	16.5	23.0
25	83	39	16.5	21.5	29.0
26	86	41	18.0	23.5	31.5
27	71	35	10.5	15.5	21.0
28	75	35	12.5	17.5	23.0
29	78	37	14.0	19.0	25.5
30	81	42	15.5	21.5	29.5

AV	AV	Total	Total	Total
MAX	MIN	Base 50	Base 40	Base 32
79.3	44.8	438.0	662.5	891.5

Day	Temperatures		Growing Degree Days		
	MAX	MIN	Base 50	Base 40	Base 32
1	62	44	6.0	13.0	21.0
2	62	46	6.0	14.0	22.0
3	63	44	6.5	13.5	21.5
4	62	45	6.0	13.5	21.5
5	59	35	4.5	9.5	15.0
6	52	28	1.0	6.0	10.0
7	58	29	4.0	9.0	13.0
8	63	30	6.5	11.5	15.5
9	71	35	10.5	15.5	21.0
10	74	34	12.0	17.0	22.0
11	73	39	11.5	16.5	24.0
12	59	37	4.5	9.5	16.0
13	39	33	0.0	0.0	4.0
14	43	26	0.0	1.5	5.5
15	47	24	0.0	3.5	7.5
16	44	33	0.0	2.0	6.5
17	50	34	0.0	5.0	10.0
18	55	24	2.5	7.5	11.5
19	51	24	0.5	5.5	9.5
20	51	39	0.5	5.5	13.0
21	52	39	1.0	6.0	13.5
22	57	26	3.5	8.5	12.5
23	57	27	3.5	8.5	12.5
24	57	27	3.5	8.5	12.5
25	57	32	3.5	8.5	12.5
26	54	40	2.0	7.0	15.0
27	48	38	0.0	4.0	11.0
28	43	26	0.0	1.5	5.5
29	47	28	0.0	3.5	7.5
30	52	27	1.0	6.0	10.0
31	49	22	0.0	4.5	8.5

AV	AV	Total	Total	Total
MAX	MIN	Base 50	Base 40	Base 32
55.2	32.7	100.5	241.0	402.5

JULIAN CALENDAR 2025

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

Winter Barley, Spring Barley, Winter Wheat, Spring Wheat



Project Title:

Winter Barley Malt Early Yield Variety Trial

Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future Winter Malt Barley varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel:

D. Larson, R. Whitehead, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki J. Sherman, J. Jensen

Summary:

49 entries of winter malt barley, in three repetitions were planted on 27 September, 2024, and harvested on 29 July, 2025. Detailed cultural practices can be found in Table 1. They were managed under rainfed conditions and received 15.25 inches of precipitation between planting and harvest.

Mean grain yield was 109.7 Bu/A with Saturn being the highest (187.3 Bu/A) and MTWF6(F4)_72-27 the lowest (94.6Bu/A). Mean test weight was 52.7 Lbs./Bu with MTWF4(F1)20_79 having the highest (54.7 Lbs./Bu) and MTWF6(F3)_5-1 the lowest (49.4 Lbs./Bu). Mean protein was 11.6 with MTWF6(F4)_13-5 being the highest (14.2%) and, MTWF4(F1)20_28 and MTWF6(F3)_24-1 being the lowest (10.4%). Mean plumps was 96.9% with MTWF6(F4)_72-23 being the highest (99.6%) and MTWF6(F3)_32-1 the lowest (81.6%). Mean heading date was day 136 (May 16), MTWF6(F4)_88-210 had the latest (day 143; 23 May) and MTWF6(F4)_73-39 the earliest (day 131; 18 May). Mean physiological maturity was day 182, (1 July), with MTW_18_67-01 Bulk the latest (day 187; 6 July) and MTWF6(F4)_22-7 the earliest (day 177; 26 June).

Table 1. Management Information

Seeding Date:	27-Sep-2024 (270)	Field Location:	X4
Seeding rate:	112 Lbs/A	Harvest date:	29-Jul-2025 (210)
Previous crop:	Production Canola	Soil type:	Creston Silt Loam
Herbicide:	Axial Bold, Cleansweep	Tillage:	Conventional Tillage
Insecticide:	N/A	Soil residual Nutrient (N,P,K Lbs./A):	63, 16, 278
Fungicide:	N/A	Nutrient Fertilizer Applied (N,P,K Lbs./A):	97-0-0

Table 2. Agronomic Performance

NAME	HD (Days)	PM (Days)	GRNFLL (Days)	PRO (%)	TWT (Lbs./Bu)	PLMPS (%)	YLD (Bu/A)
Saturn	137	183	46	10.1	51.1	96.8	<u>187.3</u>
MTWF4(F1)20_51	135	184	49	11.6	54.6	98.5	181.6
MTWF4(F1)20_27	136	185	49	9.2	52.1	98.6	174.3
Thunder	138	183	45	10.2	52.6	98.6	174.3
MTWF4(F1)20_39	132	181	49	11.6	54.5	97.8	169.8
MTWF4(F1)20_16	136	184	48	10.6	52.8	97.8	167.2
MTW_18_64-01Bulk	136	181	45	11.5	54.4	99.0	164.3
MTWF4(F1)20_46	134	180	46	11.0	53.7	98.2	163.1
MTWF4(F1)20_19	141	184	43	10.6	53.9	98.0	158.9
MTWF6(F4)_84-132	135	183	49	11.7	<u>55.6</u>	<u>99.2</u>	158.7
MTWF4(F1)20_13	133	184	51	11.0	52.3	99.1	158.6
MTWF4(F1)20_71	137	180	43	10.6	54.1	97.7	156.6
MTWF4(F1)20_20	136	184	48	9.8	52.2	98.2	154.5
Charles	138	180	42	9.4	51.0	97.5	151.2
MTW_18_54-01Bulk	134	182	48	9.8	53.8	98.1	150.3
MTW_18_67-01Bulk	142	<u>187</u>	45	9.9	52.7	97.1	148.6
MTWF6(F4)_83-120	131	180	49	11.3	51.7	98.7	147.3
MTWF6(F4)_84-135	134	184	49	11.4	55.0	98.4	147.2
MTWF5(F2)_20	135	181	46	10.9	53.0	96.7	147.2
MTWF4(F1)20_74	140	182	42	10.2	53.9	98.8	146.6
MTW_18_63-01Bulk	133	185	51	10.1	52.8	93.5	146.2
MTWF4(F1)20_85	135	179	44	12.9	54.1	99.1	145.4
MTWF6(F4)_83-121	136	180	44	11.4	53.7	96.3	145.2
MTWF6(F4)_82-114	132	182	51	10.7	53.6	98.3	144.8
MTWF6(F4)_30-3	136	182	46	10.5	52.8	98.5	144.7
MTWF6(F4)_83-123	135	179	44	11.1	51.6	98.7	144.1
MTWF4(F1)20_54	132	184	<u>52</u>	10.6	54.1	98.5	142.8
MTWF6(F4)_83-126	137	183	46	11.6	53.5	98.9	141.4
MTWF4(F1)20_62	135	180	44	10.6	53.3	98.0	140.5
MTWF4(F1)20_37	138	180	43	11.8	53.4	97.3	138.1
MTWF6(F4)_74-45	139	181	42	11.0	54.6	98.0	135.7
MTWF6(F4)_78-56	139	182	42	11.4	53.4	97.7	135.6
MTWF6(F4)_88-210	<u>143</u>	181	38	11.3	53.6	98.4	135.6
MTWF6(F4)_13-6	137	182	45	12.5	54.7	99.2	134.7
MTWF4(F1)20_48	139	185	46	11.1	53.7	93.4	134.7

Table 2. Agronomic Performance continued

NAME	HD (Days)	PM (Days)	GRNFL (Days)	PRO (%)	TWT (Lbs./Bu)	PLMPS (%)	YLD (Bu/A)
MTWF7_4-1	135	180	45	12.8	53.5	98.9	133.3
MTWF6(F4)_81-101	140	185	45	10.2	52.7	97.4	132.3
MTWF6(F4)_88-201	138	178	39	12.5	54.6	98.9	131.3
MTWF6(F4)_88-202	140	183	43	11.8	54.7	96.3	129.4
MTWF4(F1)20_25	132	179	47	12.4	53.9	98.5	128.2
MTWF6(F4)_73-39	131	181	50	12.2	54.4	96.5	128.2
MTWF6(F4)_78-55	137	178	41	11.7	53.7	99.2	128.0
MTWF6(F4)_22-7	134	177	43	12.4	54.2	95.9	125.7
MTWF6(F4)_88-203	141	180	39	11.3	54.6	98.4	122.3
MTWF6(F4)_76-51	140	180	41	12.0	53.2	98.2	121.0
MTWF6(F3)_25	136	179	43	<u>13.1</u>	54.1	99.1	114.1
MTWF6(F4)_80-91	138	182	45	11.9	53.6	98.0	112.5
MTWF6(F4)_80-87	132	179	47	12.3	53.0	97.4	111.8
MTWF6(F4)_72-27	136	178	42	11.4	53.2	99.2	94.6
Mean	136	182	45	11.2	53.5	97.93	143.49
CV %	0.8	0.8	3.7	4.62	0.83	0.56	10.07
P-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
LSD	3.99	5.17	5.91	1.76	1.53	1.85	49.23

Underline= Highest value or latest date in column, **Bold**= statistically equal to highest or latest value in column, HD= Heading Date (days), PM= Physiological Maturity (days), Pro= Protein (%), TWT= test weight (Lbs./Bu), PLMP= Plump (%), YLD= Yield (Bu/A)



Project Title:

Winter Barley Malt Intrastate Variety Trial

Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future Winter Malt Barley varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel:

D. Larson, R. Whitehead, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki J. Sherman, J. Jensen

Summary:

25 entries of winter malt barley, in three repetitions were planted on 27 September, 2024, and harvested on 25 July, 2025. Detailed cultural practices can be found in Table 1. They were managed under rainfed conditions and received 15.25 inches of precipitation between planting and harvest.

Mean grain yield was 109.7 Bu/A with Saturn being the highest (171.1 Bu/A) and MTWF6(F3)_68-1 the lowest (112.9 Bu/A). Mean protein was 11.6 with MTWF6(F4)_13-5 being the highest (14.2%) and, MTWF4(F1)20_28 and MTWF6(F3)_24-1 being the lowest (10.4%). Mean test weight was 52.7 Lbs./Bu with MTWF4(F1)20_79 having the highest (54.7 Lbs./Bu) and MTWF6(F3)_5-1 the lowest (49.4 Lbs./Bu). Mean plumps was 96.9% with MTWF6(F4)_72-23 being the highest (99.6%) and MTWF6(F3)_32-1 the lowest (81.6%). Mean heading date was day 139, 19 May, with MTWF6(F4)_15-7 the latest (day 147, 27 May) and MTWF6(F4)_86-153 the earliest (day 131, 18 May). Mean physiological maturity date was day 182, 1 July, with MTWF6(3)_32-1 the latest (day 186, 5 July) and MTWF6(4)_86-153 the earliest (day 176, 25 June).

Table 1. Management Information

Seeding Date:	27-Sep-2024 (271)	Field Location:	X4
Seeding rate:	112 Lbs./A	Harvest date:	28-Jul-2025 (209)
Previous crop:	Canola	Soil type:	Creston Silt Loam
Herbicide:	Axial Bold, Cleansweep	Tillage:	Conventional Tillage
Insecticide:	N/A	Soil Residual Nutrient (N,P,K Lbs./A):	63-15-131
Fungicide:	N/A	Nutrient Fertilizer Applied (N,P,K Lbs./A):	97-0-0

Table 2. Agronomic Performance

NAME	HD (Days)	PM (Days)	GRNFL (Days)	PRO (%)	TWT (Lbs./Bu)	PLMP (%)	YLD (Bu/A)
Saturn	139	182	43	10.6	49.9	96.9	<u>171.7</u>
MTWF4(F1)20_28	138	183	45	10.4	52.1	98.8	169.3
MTWF6(F3)_24	138	185	47	11.8	53.2	92.7	167.1
Thunder	139	181	42	10.8	52.5	99.2	166.3
MTWF6(F3)_24-1	146	184	38	10.4	51.8	89.7	160.6
MTWF4(F1)20_23	133	182	<u>50</u>	11.5	54.0	98.6	158.4
Charles	139	180	41	10.6	50.9	98.1	158.2
MTWF4(F1)20_15	138	183	46	11.7	53.3	99.2	158.1
MTWF4(F1)20_47	134	178	44	11.0	53.3	99.3	155.8
MTWF4(F1)20_79	141	181	40	10.4	<u>54.7</u>	99.3	152.3
MTWF6(F3)_5-1	142	183	42	11.2	49.4	85.2	151.5
MTWF4(F1)20_53	135	181	46	11.6	53.3	99.3	151.4
MTWF6(F4)_84-129	134	178	44	11.0	54.0	99.1	151.2
MTWF4(F1)20_59	143	182	40	11.2	53.3	99.1	149.6
MTWF4(F1)20_11	139	184	45	12.1	52.6	98.6	146.6
MTWF6(F3)_26-1	137	182	45	11.9	53.9	96.2	145.2
MTWF6(F4)_81-104	136	183	47	11.2	53.2	98.2	144.3
MTWF4(F1)20_68	140	183	42	11.5	51.3	98.4	143.3
MTWF6(F4)_72-23	138	178	40	11.6	53.1	<u>99.6</u>	140.4
MTWF6(F4)_84-127	134	178	44	12.1	54.7	99.0	132.9
MTWF6(F4)_13-5	140	181	42	<u>14.2</u>	54.1	99.4	129.2
MTWF6(F4)_15-7	<u>147</u>	183	36	11.8	53.9	98.3	127.8
MTWF6(F4)_86-153	131	176	45	12.0	52.6	99.1	125.9
MTWF6(F3)_32-1	146	<u>186</u>	40	13.0	51.3	81.6	124.1
MTWF6(F3)_68-1	139	181	42	13.3	52.2	98.4	112.9
Mean	138.6	181.7	43.1	11.6	52.7	96.9	147.8
CV %	0.8	0.9	4.2	4.4	0.8	1.8	8
P-value	>0.001	>0.001	>0.001	>0.001	>0.001	>0.001	>0.001
LSD	3.89	5.26	6.26	2.19	1.34	5.48	37.94

u= Highest value or latest date in column, **B**= statistically equal to highest or latest value in column, HD= Heading Date (days), PM= Physiological Maturity (days), Pro= Protein (%), TWT= test weight (Lbs./Bu), Plmp= Plump (%), YLD= Yield (Bu/A)



Project Title:

Intrastate Spring Barley Off-Station Variety Trial

Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future Spring Barley varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel:

D. Larson, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki, J. Sherman, G. Lutgen, J. Jensen.

Summary:

25 entries of spring barley, in three repetitions were planted on 17 April, 2025 as a farmer-field trial. This trial was irrigated and harvested on 26 August, 2025. Cultural practices are provided in Table 1. This farmer-field trial received 6 inches of rain and 13 inches of irrigation during the growing season.

Mean grain yield was 153 Bu/A with KWS Enduris being the highest (188 Bu/A) and MT20_H092_13 the lowest (125 Bu/A). Mean test weight was 55 Lbs./Bu with MT20_H092_13 having the highest (63 Lbs./Bu) and KWS Kayis the lowest (52 Lbs./Bu). Mean protein was 11.5% with MT20_H092_13 being the highest (14%) and, KWS Kayis being the lowest (10%). Mean plumps was 97% with MT20_M047_16 being the highest (99%) and MT20_H092_13 the lowest (93%) Mean heading date was day 170; 19 June, with MT19_M080_13 the earliest (day 168; 17 June), while KWS Enduris and LG Diablo the latest (day 172; 21 June).

Table 1. Management Information

Seeding date:	17-Apr-25 (107)	Field Location:	Lake Seed
Seeding rate:	N/A	Harvest date:	26-Aug-25 (238)
Previous crop:	Oats	Soil type:	Gird Silt Loam, Polson Silt Loam
Herbicide:	Rezuvant, Affinity	Tillage:	Conventional
Insecticide:	N/A	Irrigation:	13 in.
Fungicide:	Propi-Star EC	Soil Residual Nutrient (N, P, K Lbs./A):	12-166-640
		Nutrient Fertilizer Applied (N, P, K Lbs./A):	105-0-20-11S- 20 gypsum

Table 2. Agronomic Performance

NAME	HD (Days)	DTH (Days)	PRO (%)	TWT (Lbs./Bu)	PLMP (%)	YLD (Bu/A)
AAC Synergy	170	63	12.0	53.8	98.0	144.8
ABI Eagle	170	63	10.8	54.5	96.2	141.5
ABI Montana	169	62	12.4	54.0	96.8	156.5
ABI Voyager	170	63	11.4	54.2	99.0	164.8
AC Metcalfe	171	64	12.1	55.0	96.8	129.0
BC Lexy	171	64	10.6	53.3	97.8	173.1
Bill Coors 100	171	64	11.3	52.7	97.4	153.4
Buzz	169	62	11.1	53.5	98.4	154.4
Havener	171	64	11.7	63.0	89.1	130.6
Hockett	170	63	11.9	55.4	98.2	138.0
KWS Enduris	172	65	11.2	55.4	98.4	<u>188.2</u>
KWS Kayis	171	64	10.0	52.5	98.2	186.2
LCS Genie	171	64	11.4	53.8	94.6	154.1
LCS Odyssey	171	64	10.5	52.8	98.5	167.2
LG Diablo	172	65	11.4	54.2	98.2	160.9
ME031	171	64	11.2	53.4	98.0	160.4
Merit 57	171	64	12.0	54.0	93.6	163.4
MT Boy Howdy	169	62	10.8	55.0	98.7	154.2
MT Endurance	169	62	12.6	55.8	97.9	133.4
MT17M01908	169	62	11.7	56.1	99.0	169.0
MT19_M064_04	171	64	11.7	53.1	96.0	138.1
MT19_M067_02	169	62	11.5	52.8	97.4	153.0
MT19_M080_13	<u>168</u>	<u>61</u>	11.6	53.6	99.0	137.1
MT20_H092_13	170	63	<u>14.3</u>	<u>63.1</u>	93.2	124.8
MT20_M047_16	169	62	11.1	53.3	<u>99.2</u>	153.9
Mean	170.2	63.2	11.5	54.7	97.1	153.2
CV (%)	0.4	1.1	6.1	1.5	2.0	10.0
P-value	>0.001	>0.001	>0.001	>0.001	>0.001	>0.001
MSD	2.2	2.2	2.2	2.7	6.0	48.7

Bold= Highest value or earliest date in column, **Bold**= Statistically equal to highest or earliest value in column, HD= Heading Date (days), DTH= Days to Heading (days), LDG= lodging (%), Pro= Protein (%), TWT= test weight (Lbs./Bu), PLMP= Plumps (%), YLD= Yield (Bu/A)

Project Title:

Optimizing Nitrogen Inputs to Reduce Scope 3 Emissions in Barley Production in Montana, Idaho, and North Dakota

Objective:

To provide growers in northwestern Montana with reliable, unbiased, and up-to-date data on Spring Malt Barley fertilizer sources and rates.

Personnel:

D. Larson, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki, J. Jensen

Summary:

The primary objective of this study was to identify nitrogen products that could be used to reduce overall nitrogen inputs in barley production. This study consisted of 12 fertilizer treatments, replicated three times across a dry and sub-irrigated environment, for a total of 72 plots. AAC Synergy was the variety used for this study. This study was also grown in North Dakota and Idaho. The dryland environment, R2, was planted on 18 April 2025 and harvested on 15 August 2025. The sub-irrigated environment, D4, was planted on 15 April 2025 and harvested on 18 August 2025. Rainfall amounted to 6.33 in from the earlier planting date to the later harvest date. Cultural practices can be found in tables 1 and 2.

The yield goal for both environments was 100 Bu./A, with a nitrogen rate calculated at 120 Lbs./A; all non-urea fertilizer treatments were applied at 80% of this rate. Urea was applied at four rates, 60%, 80%, 100%, and 120% to create a measurable response curve of the different nitrogen products. See Table 3 for fertilizer products used.

Mean yield across both environments was 119 Bu./A, while mean protein was 13%. Yields were comparable across all treatments, excluding the 120% urea rate, which saw slightly increased yields (Figure 1). Protein data was also uniform across the dry land environment but showed more variability in the sub-irrigated environment (Figure 2). ESN showed an increase in protein for the sub-irrigated environment while UAN had a decrease in protein. This suggests UAN applied via foliar spray could be a good product for maintaining yields while keeping protein levels low. This data also suggests that we could reduce nitrogen inputs by up to 20% and see similar yields with conventional urea. Our collaborates in North Dakota and Idaho saw similar results however the data is not shown in this report.

This study will be conducted for a second year to confirm the results we have observed using these different nitrogen products. It is also important to know that all the products were applied before a rain fall; therefore, we were unable to test the volatilization risk

reduction that some of these products advertised. An economic assessment of the products will be conducted after the second year of testing along with an evaluation of the scope 3 emissions from each of these products.

Table 1. R2 Management Information

Seeding date:	18-Apr-25 (108)	Field Location:	R2
Seeding rate:	N/A	Harvest date:	15-Aug-25 (227)
Previous crop:	Alfalfa	Soil type:	Creston Silt Loam
Herbicide:	2,4-D	Tillage:	No Till
Insecticide:	N/A	Soil Residual Nutrient (N, P, K Lbs./A):	31,6,102
Fungicide:	N/A	Nutrient Fertilizer Applied (N, P, K Lbs./A):	*,45,100

*Variable amounts of N applied.

Table 2. D4 Management Information

Seeding date:	15-Apr-25 (105)	Field Location:	D4
Seeding rate:	N/A	Harvest date:	18-Aug-25 (230)
Previous crop:	Canola	Soil type:	Swims Silty Clay Loam
Herbicide:	Axial Bold/ Cleansweep	Tillage:	Conventional
Insecticide:	N/A	Soil Residual Nutrient (N, P, K Lbs./A):	17,26,230
Fungicide:	N/A	Nutrient Fertilizer Applied (N, P, K Lbs./A):	*,20,50

*Variable amounts of N applied.

Table 3. Selected Fertilizer Products

Fertilizer	Analysis	Description
Urea	46% N	Most widely used, due to high N and low cost.
CAN27 (Calcium Ammonium Nitrate)	27% N, 4% Ca	Provides both nitrate and ammonium form of N with added calcium, improving soil structure and reducing volatility.
Amidas (Urea + Ammonium Sulfate)	35% urea N, 5% ammonium-N, 5.5% S	Combines rapid and stable N forms, adding sulfur to enhance protein synthesis and improve grain quality. Liquid fertilizer containing both urea and ammonium nitrate;
UAN (Urea Ammonium Nitrate)	28% N	liquid formulation allows uniform application and better soil contact, enhancing N availability.
ESN (Environmentally Smart Nitrogen)	44% N	Polymer-coated urea that provides slow N release, minimizing leaching and volatilization losses.
SuperU	46% N	Stabilized urea with both a urease inhibitor (NBPT) and a nitrification inhibitor (DCD)
Urea + NBPT	46% N	Urea treated with urease inhibitor NBPT
Urea+ Pivot bio	46% N	Seed treated microbial inoculant that attach to crop roots, feed on root exudates and fix atmospheric N

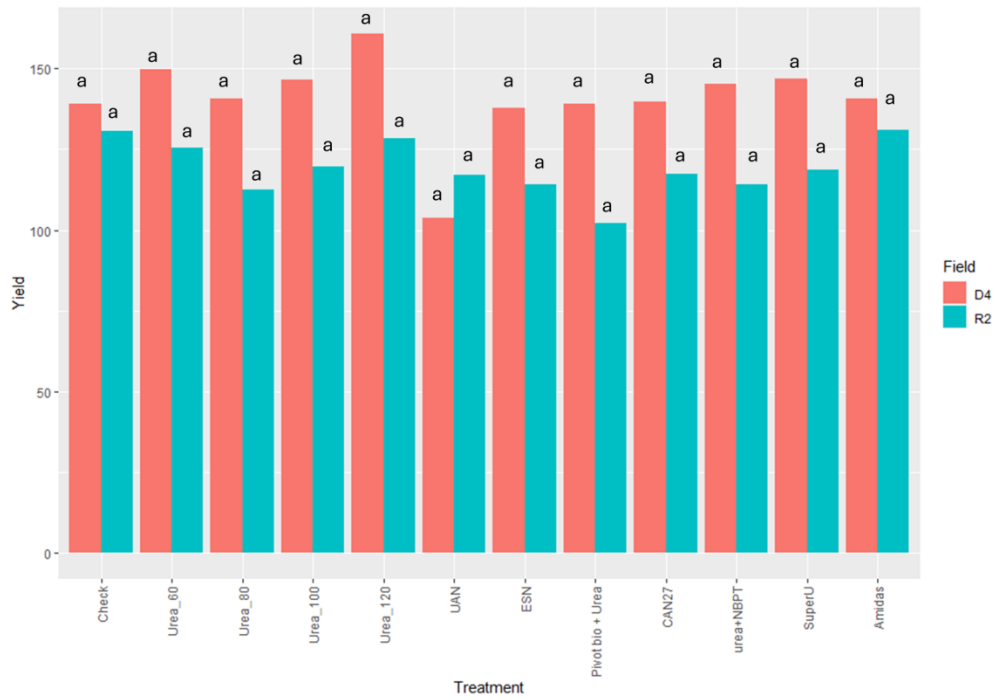


Figure 1. Shows comparable yields across all treatments except for the 120% urea rate.

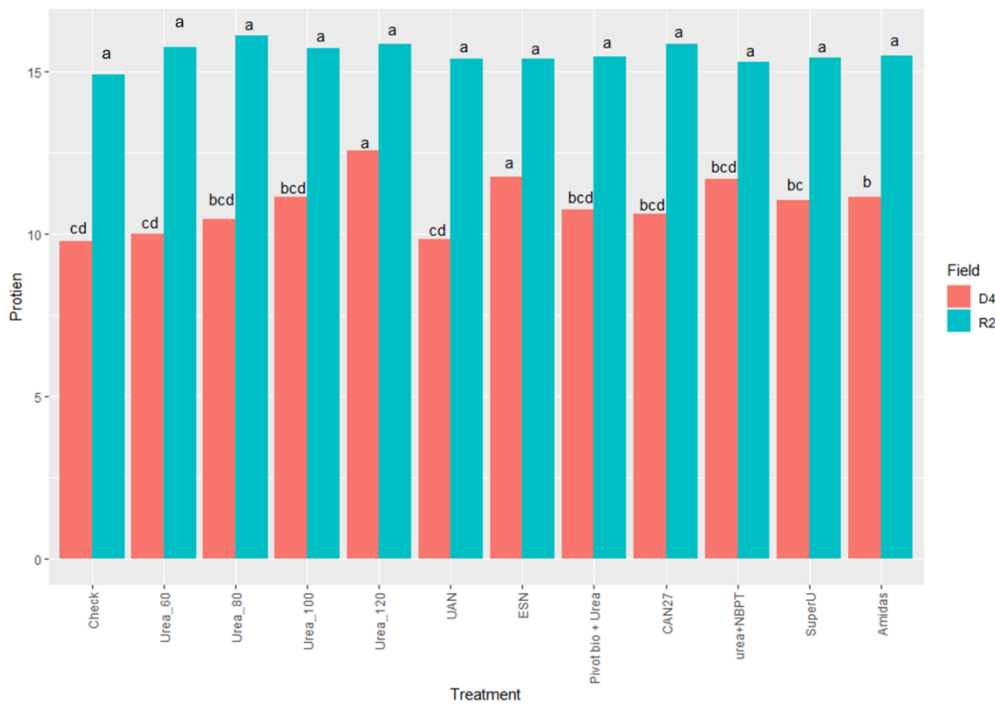


Figure 2. shows the uniformity of protein in the dryland field and the variability in the sub-irrigated field.



Project Title:

Intrastate Winter Wheat Variety Trial

Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future winter wheat varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel:

D. Larson, R. Whitehead, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki, A. Lehnerz, S. Mondal, J. Jensen

Summary:

49 entries of winter wheat, in three replications, were planted on 9 October 2024, and harvested on 6 August 2025, cultural practices can be found in Table 1. This trial was rainfed, receiving 15.9 inches between planting and harvest.

Mean yield was 153.5 Bu/A with MT Meadowlark having the highest (173.3 Bu/A) and CP7017AX being the lowest (127.4 Bu/A). Mean protein was 10.7% with MT2335 having the highest (11.9%) and AP24AX the lowest (9.6%). Mean test weight was 62.5 lbs./Bu, MTCS2264 had the highest (63.8 Lbs./Bu) and MTAX22120 the lowest (60.8 Lbs./Bu). Mean heading date was 154 Julian days (4 June) with Brawl CL Plus and CP7869 having the earliest (Day 151, 31 May) and, MTS2286 and ACC Wildfire the latest (Day 160, 9 June). Mean grain fill was 39 days, with LCS Steel AX having the longest grain fill period (43 days) and MTCS22128 having the shortest, (35 days). Mean falling number was 346.6 seconds with Warhorse the highest (470.7 seconds) and MT2327 the Lowest (129.5 seconds).

Table 1. Management Information

Seeding date:	9 October 2024 (283)	Field Location:	X5
Seeding rate:	N/A	Harvest date:	6 August 2025 (218)
Previous crop:	Canola	Soil type:	Creston Silt Loam
Herbicide:	Axial Bold /Cleansweep	Tillage:	Conventional
Insecticide:	N/A	Soil residual nutrient (N, P, K Lbs./A):	63, 16, 278
Fungicide:	N/A	Nutrient fertilizer applied (N, P, K Lbs./A):	97, 0, 0

Table 2. Agronomic Performance

NAME	HD (Days)	PM (Days)	GRNFL (Days)	PRO (%)	TWT (Lbs./Bu)	YLD (Bu/A)	FN (Seconds)
AAC Coldfront	155	196	41	11.09	62.5	157.7	323.4
AAC Vortex	156	196	41	11.28	62.1	144.1	307.2
AAC Wildfire	160	198	38	10.12	63.2	145.3	392.1
AP Solid	154	195	41	10.12	62.3	139.0	336.8
AP Sunbird	152	189	37	10.39	62.4	150.3	325.0
AP24AX	154	196	43	9.60	61.9	169.9	370.8
Bobcat	154	193	39	10.70	62.5	149.8	381.2
Brawl CL Plus	151	192	40	11.51	61.5	141.8	365.3
CO21SF191RA	154	194	40	10.90	62.4	157.6	361.8
CO21SF263RA	155	195	40	10.66	62.3	155.2	391.3
CP7017AX	152	191	39	11.06	62.5	127.4	424.0
CP7462	152	190	38	10.75	60.9	160.4	409.0
CP7869	151	189	38	10.77	61.3	149.8	343.5
CS Bridger CLP	154	192	38	10.50	60.9	160.4	248.5
Flathead	152	191	39	11.21	62.5	156.3	214.6
FourOsix	154	195	41	10.61	61.6	167.3	375.6
Judee	154	194	40	10.55	62.8	137.8	224.7
Keldin	154	194	40	10.68	61.9	163.2	296.2
LCS Atomic AX	152	193	40	11.24	61.7	156.1	362.4
LCS Missile	155	194	39	10.28	61.8	165.0	367.6
LCS Radar	152	189	37	11.00	61.8	156.6	351.5
LCS Steel AX	154	196	43	9.95	62.1	160.7	304.5
Loma	156	197	40	10.99	62.1	154.2	188.4
MT Meadowlark	158	196	38	11.13	63.1	173.3	412.1
MT WarCat	160	195	36	10.37	62.9	154.7	413.9
MT2142	156	194	38	11.38	62.8	157.3	432.2
MT2230	153	192	39	10.99	61.9	141.5	382.0
MT2270	154	195	41	10.06	61.8	167.0	358.2
MT2327	153	190	37	10.28	61.4	150.6	129.5
MT2335	153	195	42	11.90	60.9	153.6	388.7
MTAX21203	153	194	41	10.51	62.8	143.9	386.1
MTAX22120	153	192	39	9.73	60.8	158.0	267.8
MTCS22127	153	192	39	10.92	61.6	157.5	330.6
MTCS22128	160	195	35	10.66	62.0	158.7	362.9
MTCS2264	154	193	38	11.62	63.8	140.8	319.2

Table 2. Agronomic Performance continued

NAME	HD (Days)	PM (Days)	GRNFLL (Days)	PRO (%)	TWT (Lbs./Bu)	YLD (Bu/A)	FN (Seconds)
MTFHS23316	156	196	40	11.62	62.1	140.5	368.6
MTS21103	156	195	39	10.58	61.8	158.4	383.6
MTS2286	160	197	37	10.63	61.8	158.6	399.4
MTS2294	154	191	37	10.38	63.1	140.6	341.6
MTS23103	152	190	38	11.50	61.9	147.1	416.3
MTV2164	153	194	41	10.39	61.3	154.7	407.7
NAS-25MT-01	159	197	38	10.03	61.3	157.4	295.2
NAS-25MT-02	154	190	36	10.02	61.9	157.9	328.6
Northern	158	196	38	10.28	61.7	159.6	319.4
Ramsay	154	193	39	10.25	62.1	156.6	269.5
StandClear CLP	154	191	37	10.58	62.4	142.7	411.0
SY Clearstone 2CL	154	194	40	10.44	61.8	157.7	354.9
Warhorse	155	194	39	11.81	62.4	145.6	<u>470.7</u>
Yellowstone	155	195	40	11.17	62.5	160.4	369.1
Mean	155	194	39	10.72	62.05	153.50	346.63
CV (%)	0.75	0.57	3.35	5.26	0.55	6.94	11.87
P-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
MSD	3.88	3.73	4.40	1.89	1.15	35.85	138.45

Underline= Highest value or earliest date in column, **Bold**= statistically equal to highest or earliest value in column, HD= Heading Date (days), PM= Physiological Maturity (days), GRNFLL= Grain fill (days), Pro= Protein (%), TWT= test weight (Lbs./Bu), YLD= Yield (Bu/A), FN= Falling Number (seconds)



Project title:

Winter Wheat Advanced Variety Trial

Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future winter wheat varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel:

D. Larson, R. Whitehead, Z. Sippel, E. McGarvey, R. Arakaki S. Mondal, J. Jensen

Summary:

36 entries of winter wheat, in three repetitions were planted on 9 October 2024, and harvested on 5 August 2025. Cultural practices can be found in Table 1. This trial was rain fed, receiving 16 inches between planting and harvest.

Mean yield was 147 Bu/A with MT2404 having the highest (171 Bu/A) and MTS2272 being the lowest (110 Bu/A). Mean protein was 11.03% with MT2443 having the highest (12.1%) and MT2219, MTS2298, and Yellowstone the lowest (10.3%). Mean test weight was 62 Lbs./Bu, MT Meadowlark had the highest (63 Lbs./Bu) and MT2450 the lowest (60 Lbs./Bu). Mean heading date was 1 June (152 Julian days) with MTF2427 having the earliest (day 150; 30 May) and, MTS24143 the latest (day 157; 6 June). Mean period of grain fill was 40 days, with MTS23135 having the longest (43 days) and MT2407 having the shortest, (38 days). Mean falling number was 358 seconds, with Warhorse having the longest (465 seconds) and MTFHS24105 having the shortest (182 seconds).

Table 1. Management Information

Seeding date:	9 October 2024 (283)	Field Location:	X5
Seeding rate:	N/A	Harvest date:	5-Aug-25 (217)
Previous crop:	Canola	Soil type:	Creston Silt Loam
Herbicide:	Axial Bold/Cleansweep	Tillage:	Conventional
Insecticide:	N/A	Soil residual nutrient (N, P, K Lbs./A):	63, 16, 278
Fungicide:	N/A	Nutrient fertilizer applied (N, P, K Lbs./A):	97, 0, 0

Table 2. Agronomic Performance

NAME	HD (Days)	GRNFLL (Days)	PM (Days)	HT (cm)	PRO (%)	TWT (Lbs./Bu)	YLD (Bu/A)	FN (Seconds)
Bobcat	154	40	194	51.2	11.73	62.5	140.3	365.2
MT Meadowlark	156	40	195	55.6	10.64	<u>62.9</u>	158.6	432.0
MT2219	155	40	195	57.2	10.29	60.9	154.4	409.3
MT2262	151	43	193	49.1	10.66	62.2	154.1	242.7
MT2325	152	39	192	50.8	10.69	61.9	145.3	342.1
MT2404	155	41	196	60.8	10.40	60.9	<u>170.6</u>	400.9
MT2407	152	38	190	54.0	10.85	60.9	123.3	283.3
MT2408	153	41	194	51.4	11.44	61.2	149.9	331.8
MT2416	155	39	194	54.6	10.87	61.6	146.9	364.8
MT2430	151	42	193	56.6	10.87	61.8	159.1	354.5
MT2443	151	39	190	<u>63.4</u>	<u>12.12</u>	62.3	162.0	303.1
MT2444	153	40	193	55.6	10.79	61.4	153.4	396.0
MT2448	152	41	193	57.1	11.05	62.1	150.3	394.1
MT2450	151	39	190	50.9	10.57	60.3	120.1	376.7
MTF2427	<u>150</u>	40	190	59.3	10.46	61.7	158.9	332.6
MTFHS24105	153	41	194	55.7	11.79	61.1	139.3	182.2
MTS22118	152	39	191	53.2	11.32	61.4	150.0	345.1
MTS2272	151	38	<u>190</u>	48.3	10.46	61.1	109.8	381.6
MTS2298	151	39	191	53.6	10.31	62.6	156.3	363.6
MTS23126	151	42	193	47.7	11.84	62.4	133.2	437.7
MTS23135	152	<u>43</u>	195	54.1	11.74	62.0	152.8	402.9
MTS23142	153	42	195	54.0	10.85	60.9	149.4	455.6
MTS24108	151	40	191	56.3	10.67	61.3	142.7	326.6
MTS24114	152	38	190	59.8	10.88	62.2	137.8	388.0
MTS24115	153	39	192	53.4	11.02	62.1	153.6	393.7
MTS24120	156	39	195	62.8	11.36	62.4	148.9	383.9
MTS24125	151	40	192	55.2	11.53	61.9	142.3	401.1
MTS24130	151	40	191	55.9	11.32	62.4	152.7	357.2
MTS24138	152	40	193	55.0	12.00	62.1	141.7	217.9
MTS24143	157	38	195	56.4	10.78	62.7	142.7	267.0
MTS24145	156	39	195	57.8	10.94	61.6	156.7	389.4
MTS24146	156	38	194	55.1	10.35	61.9	128.1	312.1
MTS24150	152	40	192	52.8	11.46	61.0	157.6	408.5
SY Monument	151	39	190	55.6	10.32	60.4	147.9	339.8
Warhorse	152	42	195	58.6	12.05	62.1	146.7	<u>464.7</u>
Yellowstone	152	41	193	50.7	10.50	62.1	155.1	330.1

Table 2. Agronomic Performance continued

NAME	HD (Days)	GRNFLL (Days)	PM (Days)	HT (cm)	PRO (%)	TWT (Lbs./Bu)	YLD (Bu/A)	FN (Seconds)
Mean	152.69	40.02	192.71	54.99	11.03	61.73	147.01	357.72
CV	0.50	4.30	0.82	5.75	4.23	0.60	9.81	8.67
P-Value	<0.001	0.008	<0.001	<0.001	<0.001	<0.001	0.002	<0.001
MSD	2.51	5.63	5.15	10.35	1.53	1.22	47.17	101.48

HD= Highest value or earliest date in column, **PM**= statistically equal to highest or earliest value in column, HD= Heading Date (days), GRNFLL= Grainfill (days), PM= Physiological Maturity (days), HT= Height (cm), Pro= Protein (%), TWT= test weight (Lbs./Bu), YLD= Yield (Bu/A), FN= Falling Number (seconds)

Project Title:

Clearfield Winter Wheat Qualification Variety Trial

**Objective:**

Pre-commercialization demonstration of required 2x tolerance to Beyond herbicide with SY Clearstone as the genetic standard.

Personnel:

D. Larson, R. Whitehead, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki A. Lehnerz, A. Gaur, S. Mondal, J. Jensen

Summary:

Ten varieties of winter wheat were planted on 9 October 2024 and harvested on 5 August 2025. The 10 varieties were paired with two different herbicide applications: one being the label recommended rate and the other with 2x the recommended rate of Beyond herbicide, replicated three times. This trial was under rain fed conditions, receiving 16 inches of water during the growing period. Further management practices can be found in Table 1.

Amongst entries treated at the 2x rate of Beyond, the mean yield was 148 Bu/A with SY Clearstone 2CL the highest (155 Bu/A) and MTCS23501 the lowest (142 Bu/A). Mean protein was 11% with StandClear CLP having the highest (11.5%) and SY Clearstone 2CL the lowest (10%). Mean test weight was 62 Lbs./Bu with MTCS23534 having the highest (63 Lbs./Bu) and MTCS23501 the lowest (60 Lbs./Bu). Mean thousand kernel weight was 37 g, with SY Clearstone the highest (42 g) and MTCS23526 the lowest (33 g). Mean falling number was 324 seconds with MTCS23534 the highest (435 seconds) and MTCL19151 the lowest (232 seconds). Mean crop injury rating was 0.3, with MTCS23534 the highest (2.0) and MTCL19151, MTCS22127, MTCS23501, MTCS23509, MTCS23512, and StandClear CLP the lowest (0.0).

Amongst the recommended rate treated entries, mean yield was 145 Bu/A with MTCS223512 being highest (154 Bu/A) and MTCS23501 the lowest (136 Bu/A). Mean protein was 9.5% with MTCS23534 the highest (9.9%) and SY Clearstone 2CL the lowest (8.7%). Mean test weight was 61 Lbs./Bu with MTCS23509 the highest (62 Lbs./Bu) and MTCS19151 the lowest (60 Lbs./Bu). Mean thousand kernel weight was 37 g with SY Clearstone 2CL the highest (42 g) and MTCS23526 the lowest (33 g). Mean falling number was 316 seconds with MTCS23534 the highest (400 seconds) and MTCL19151 the lowest (253 seconds) Mean crop injury rating was 0.27, with SY Clearstone 2CL the highest (1.3) and MTCL19151, MTCS23501, MTCS23509, MTCS23526, MTCS23534, and StandClear CLP the lowest (0.0).

When comparing the recommended rate and 2x rate Beyond treatments we observed minimal differences. All traits, excluding protein, were comparable with 2x Beyond treatment seeing slightly increased protein levels. It is unclear if this is due to field placement or an effect of the beyond treatment.

Table 1. Management Information

Seeding date:	9 October 2024 (283)	Field Location:	X5
Seeding rate:	N/A	Harvest date:	5 August 2025 (217)
Previous crop:	Canola	Soil type:	Creston Silt Loam
Herbicide:	2X Beyond + MSO 2% v/v +UAN 5% v/v, Axial Bold, Cleansweep	Tillage:	Conventional
Insecticide:	N/A	Soil residual nutrient (N, P, K Lbs./A):	63, 16, 278
Fungicide:	N/A	Nutrient fertilizer applied (N, P, K Lbs./A):	97, 0, 0

Table 2. Agronomic performance in the 2X Beyond treated environment

NAME	CI (0-10)	HD (Days)	PM (Days)	GRN FLL (Days)	PRO (%)	TWT (Lbs./Bu)	TKW (g)	YLD (Bu/A)	FN (Seconds)
MTCL19151	0.00	<u>153</u>	194	41	11.06	61.4	36.5	153.7	231.7
MTCS22127	0.00	153	<u>191</u>	38	11.04	61.7	37.7	148.7	374.3
MTCS22128	0.67	156	195	39	10.34	61.6	37.0	147.6	348.2
MTCS23501	0.00	155	194	39	10.74	60.6	34.6	142.0	124.7
MTCS23509	0.00	159	197	38	10.96	62.7	40.1	142.5	428.9
MTCS23512	0.00	153	197	<u>44</u>	10.89	61.6	35.7	149.9	285.3
MTCS23526	0.33	155	193	38	11.12	61.5	33.1	148.7	397.9
MTCS23534	<u>1.67</u>	159	197	38	11.04	<u>62.8</u>	39.0	142.7	<u>434.8</u>
StandClear CLP	0.00	153	195	41	<u>11.47</u>	62.4	38.7	149.9	282.2
SY Clearstone 2CL	0.33	155	196	41	10.02	61.9	<u>41.6</u>	<u>155.4</u>	336.1
Mean	0.30	155.23	194.97	39.73	10.87	61.81	37.40	148.12	324.38
CV (%)	341.26	0.31	0.38	1.63	4.85	0.40	3.25	5.54	11.43
P-value	0.61	<0.001	<0.001	<0.001	0.13	<0.001	<0.001	0.52	<0.001
MSD	3.00	1.41	2.20	1.89	1.54	0.72	3.56	24.04	108.56

= Highest value or earliest date in column, **Bold** = statistically equal to highest or earliest value in column, CI= Crop injury (0-10), HD= Heading Date (days), PM= Physiological Maturity (days), GRNFLL= Grain fill (days), Pro= Protein (%), TWT= test weight (Lbs./Bu), TKW= thousand kernel weight (g), YLD= Yield (Bu/A), FN= Falling Number (seconds)

Table 3. Agronomic performance in the recommended rate treated environment

NAME	CI (0-10)	HD (Days)	PM (Days)	GRN FLL (Days)	PRO (%)	TWT (Lbs./Bu)	TKW (g)	YLD (Bu/A)	FN (Seconds)
MTCL19151	0.00	<u>153</u>	<u>193</u>	39	9.14	60.2	35.6	142.7	253.1
MTCS22127	1.00	153	192	39	9.68	60.9	37.1	147.0	363.5
MTCS22128	0.33	158	195	38	9.79	61.4	35.5	147.9	370.4
MTCS23501	0.00	158	194	37	9.18	60.5	35.4	135.8	118.7
MTCS23509	0.00	159	198	39	9.52	<u>62.2</u>	38.7	143.0	378.7
MTCS23512	0.00	154	196	<u>42</u>	10.18	61.2	34.8	<u>153.8</u>	295.5
MTCS23526	0.00	155	193	37	9.62	60.8	32.7	138.8	378.6
MTCS23534	0.00	159	199	40	<u>9.88</u>	61.9	38.4	143.4	<u>400.3</u>
StandClear CLP	0.00	154	192	38	9.68	61.2	37.7	145.2	290.6
SY Clearstone 2CL	<u>1.33</u>	156	196	40	8.73	60.8	<u>42.2</u>	148.7	309.0
Mean	0.27	155.87	194.80	38.93	9.54	61.11	36.81	144.63	315.83
CV (%)	178.24	0.47	0.42	2.93	6.94	0.76	2.95	6.94	6.91
P-value	0.02	<0.001	<0.001	0.001	0.35	0.002	<0.001	0.64	<0.001
MSD	1.39	2.16	2.38	3.34	1.94	1.36	3.18	29.39	63.91

Underline= Highest value or earliest date in column, **Bold**= statistically equal to highest or earliest value in column, CI= Crop injury (1-10), HD= Heading Date (days), PM= Physiological Maturity (days), GRNFLL= Grain fill (days), Pro= Protein (%), TWT= test weight (Lbs./Bu), TKW= thousand kernel weight (g), YLD= Yield (Bu/A), FN= Falling Number (seconds)



Project title:

Off-Station Winter Wheat Variety Trial

Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future winter wheat varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel:

D. Larson, R. Whitehead, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki, A. Lehnerz, A. Gaur, S. Mondal, J. Jensen

Summary:

25 entries of winter wheat, with three repetitions, were planted on 3 October 2024 as an on-farm trial and was harvested on 14 August 2025. Cultural practices are provided in Table 1. This trial was rain-fed and received approximately 16 inches of rain.

Mean yield was 105 Bu/A, MT Meadowlark had the highest yield (130 Bu/A) while Flathead was the lowest yielding (90 Bu/A). The mean protein was 13.3%, with MT2142 having the highest protein (15 %) and Flathead being the lowest (9.7%). The mean test weight was 61.4 Lbs./Bu, MTCS2264 was the highest (63 Lbs./Bu) and MTS2286 was the lowest (60 Lbs./Bu). The mean heading date was 161 Julian days (10 June) with Brawl CL Plus the earliest (day 157; 6 June) and Northern as the latest (day 165; 14 June). Mean grain fill was 30 days, with Brawl CL Plus the longest (34 days) and Northern the shortest (27 days).

Table 1. Management Information

Seeding date:	3 October 2024 (277)	Field Location:	Jaquette Rd
Seeding rate:	N/A	Harvest date:	14 August 2025 (226)
Previous crop:	Canola	Soil type:	Creston Silt Loam
Herbicide:	Cleaver 6B	Tillage:	No-Till
Insecticide:	N/A	Soil Residual Nutrient (N,P,K Lbs./A) :	N/A
Fungicide:	N/A	Nutrient Fertilizer Applied (N,P,K Lbs./A):	130, 0, 25

Table 2. Agronomic Performance

NAME	HD (Days)	PM (Days)	GRN FILL (Days)	HT (in)	PRO (%)	TWT (Lbs./Bu)	YLD (Bu/A)
AAC Coldfront	160	193	34	29.5	12.62	61.3	124.1
AAC Wildfire	165	194	29	30.9	13.23	62.3	102.7
Bobcat	165	<u>190</u>	25	26.1	13.34	61.7	101.4
Brawl CL Plus	<u>157</u>	191	<u>34</u>	28.7	13.70	61.8	95.6
CS Bridger CLP	163	194	31	25.1	12.99	61.6	106.0
Flathead	159	192	33	27.4	12.84	61.7	90.3
Fortress	159	191	32	30.6	12.97	60.6	107.9
FourOsix	162	192	30	28.4	13.07	60.6	117.4
Keldin	161	192	31	29.6	12.96	61.3	110.6
Loma	163	192	29	26.0	13.87	61.1	93.8
MT Meadowlark	164	192	28	27.6	11.91	62.1	<u>130.0</u>
MT WarCat	164	192	28	27.3	13.28	62.0	102.1
MT2142	163	192	29	26.4	<u>14.79</u>	61.3	114.7
MT2270	162	192	30	25.5	12.15	61.4	90.9
MTAX21203	159	192	33	29.5	13.77	62.6	108.2
MTAX22120	158	192	34	25.4	12.07	60.6	96.5
MTCS22127	162	191	29	29.8	13.06	60.7	115.9
MTCS2264	162	192	30	27.8	14.45	<u>62.9</u>	99.6
MTS2286	164	192	28	27.2	13.19	60.4	104.1
MTV2164	160	191	31	30.0	14.62	61.1	101.4
Northern	165	192	27	30.8	14.42	60.9	112.6
StandClear CLP	164	192	29	28.6	14.13	61.8	106.3
SY Monument	158	191	34	28.3	12.49	60.9	92.2
Warhorse	162	191	29	27.6	13.08	61.2	104.6
Yellowstone	164	193	29	<u>31.4</u>	13.09	62.0	108.9
Mean	161.6	191.9	30.2	28.2	13.3	61.4	105.5
CV (%)	1.2	0.7	6.4	5.0	7.9	0.7	13.7
P-Value	<0.001	0.09	<0.001	<0.001	0.07	<0.001	0.14
MSD	6.2	4.1	6.1	4.5	3.3	1.4	45.7

Underline= Highest value or earliest date in column, **Bold**= Statistically equal to highest or earliest value in column, HD= Heading Date (days), PM= Physiological Maturity (days), GRNFLL= Grain fill (days), HT= Height (cm), Pro= Protein (%), TWT= test weight (Lbs./Bu), YLD= Yield (Bu/A)

Project title:

Spring Wheat Advanced Year Variety Trial



Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future spring wheat varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel:

D. Larson, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki, J. H. Heo, J. Cook, J. Jensen

Summary:

64 entries of spring wheat, in three repetitions, were planted on 28 April 2025 and harvested on 25 September 2025. Detailed cultural practices are provided in Table 1. This was a rainfed trial and received 6.62 inches of rainfall for the growing season.

Mean yield was 126 Bu/A with WF 241 having the highest (154 Bu/A) and CI 10003 the lowest (83 Bu/A). Mean test weight was 63 Lbs./Bu, with SYN 241 the highest (65 Lbs./Bu) and CI 10003 the lowest (61 Lbs./Bu). Mean protein was 14.89%, with MT 23085 the highest (16%) and WF 241 the lowest (13%). Mean heading date was day 174 (23 June) with MT 23130 having the earliest (day 169; 18 June) and WF 242 the latest (day 192; 10 July). Mean grain fill was 42 days with MT 21484 the longest (47 days) and WF 242 the shortest (33 days). Mean falling number was 372 seconds, with PI 574642 was the highest (492 seconds) and WF 242 the lowest (179 seconds).

Table 1. Management information

Seeding date:	28-Apr-25 (118)	Field Location:	R9
Seeding rate:	N/A	Harvest date:	25-Aug-25 (237)
Previous crop:	Fallow	Soil type:	Flathead Fine Sandy Loam
Herbicide:	Axial Bold/ Cleansweep	Tillage:	Conventional
Insecticide:	N/A	Soil Residual Nutrient (N, P, K Lbs./A):	142.5, 18, 448
Fungicide:	N/A	Nutrient Fertilizer Applied (N, P, K Lbs./A):	86, 30, 8.6

Table 2. Agronomic Performance

NAME	HD (Days)	PM (Days)	GRNFL (Days)	PRO (%)	TWT (Lbs./Bu)	FN (Seconds)	YLD (Bu/A)
AGRIPR 161	176	214	38	14.41	62.8	431.3	121.8
BZ 917-277	176	219	42	14.48	63.4	366.0	122.5
BZ 92413R	175	218	43	13.62	64.1	385.9	112.3
CI 10003	175	215	40	15.56	60.9	383.3	83.0
LIMAGR 211	171	213	42	14.48	63.8	289.2	130.7
LIMAGR 231	170	208	38	15.15	64.7	343.8	127.1
LIMAGR 251	172	210	39	14.56	64.2	429.1	122.8
MS 201	179	217	37	14.18	62.5	389.5	108.6
MS 211	176	214	38	15.73	62.9	429.1	115.8
MS 241	172	211	39	14.75	64.0	431.6	119.2
MS 242	172	216	43	13.03	63.5	395.4	127.0
MT 1809	176	219	43	15.80	62.1	403.9	133.8
MT 1939	172	213	41	14.70	63.2	365.1	130.0
MT 2030	173	213	40	15.04	63.4	295.2	133.4
MT 21074	175	216	41	15.33	63.7	364.3	120.8
MT 21174	173	218	45	14.83	64.0	400.3	128.8
MT 21484	173	220	47	15.71	63.2	410.0	119.7
MT 21487	174	218	44	14.64	63.0	432.9	121.8
MT 22073	170	210	39	15.72	62.7	410.7	121.5
MT 22083	170	214	44	15.02	63.7	374.2	116.9
MT 22182	171	214	43	15.01	62.6	392.9	132.8
MT 22205	172	214	43	15.65	63.2	332.4	138.6
MT 22345	174	216	42	14.74	61.6	419.6	115.5
MT 23039	174	219	45	14.65	63.4	338.2	125.6
MT 23052	174	219	45	14.62	62.5	321.0	125.8
MT 23067	172	215	44	15.44	64.3	319.3	125.4
MT 23084	172	215	44	15.70	63.8	436.2	133.1
MT 23085	174	217	42	16.02	62.7	394.1	121.9
MT 23098	174	219	45	15.62	63.2	285.7	127.4
MT 23110	171	214	43	14.27	64.2	269.8	141.1
MT 23113	174	215	42	15.79	63.3	363.6	118.1
MT 23116	173	217	44	14.51	63.0	369.9	132.5

Table 2. Agronomic Performance continued

NAME	HD (Days)	PM (Days)	GRNFL (Days)	PRO (%)	TWT (Lbs./Bu)	FN (Seconds)	YLD (Bu/A)
MT 23127	175	216	41	14.48	63.7	368.9	141.6
MT 23130	<u>169</u>	210	41	15.12	62.6	373.4	126.4
MT 23133	169	210	41	15.26	63.6	376.1	130.0
MT 23184	172	217	45	15.25	64.0	301.2	125.9
MT 23204	174	213	39	15.07	63.4	346.2	122.5
MT 23205	176	218	42	14.68	63.5	357.9	134.7
MT 23241	176	221	45	15.02	62.4	352.5	120.2
MT 23265	175	220	45	15.18	61.1	332.2	125.7
MT 23275	172	218	46	14.27	63.7	321.4	124.2
MT 23294	176	218	42	15.25	64.0	284.5	121.2
MT 23297	178	218	39	15.09	62.4	353.6	134.1
MT 23339	174	218	44	15.11	63.0	400.0	117.8
MT 23385	177	219	41	15.11	63.6	372.8	129.9
ND 695	176	219	43	15.65	64.0	415.5	119.6
NDHRS14-0134-C03	175	214	40	13.80	62.8	427.4	118.2
PG 251	175	212	37	14.42	64.5	465.8	128.5
PI 574642	177	214	37	14.13	62.8	<u>491.9</u>	117.1
PI 642366	175	218	43	14.90	63.1	335.2	126.2
PI 660981	171	217	45	15.12	62.6	334.4	122.9
PI 676978	172	214	42	15.50	63.3	288.3	129.7
PI 679964	179	221	43	14.71	61.8	360.9	107.1
PI 690450	172	218	46	15.65	64.2	385.5	128.5
SYN 182	174	213	39	15.17	64.4	450.1	121.7
SYN 211	175	216	41	14.90	64.6	408.2	123.3

Table 2. Agronomic Performance continued

NAME	HD (Days)	PM (Days)	GRNFL (Days)	PRO (%)	TWT (Lbs./Bu)	FN (Seconds)	YLD (Bu/A)
SYN 212	174	217	42	15.88	63.4	483.9	118.9
SYN 241	175	210	35	14.55	64.8	427.5	131.2
SYN 251	175	215	40	14.01	63.8	399.4	134.0
SYN 252	174	212	38	14.48	64.3	387.6	127.3
WB 222	172	212	40	15.75	63.0	454.2	125.6
WB 9879 CLP	175	216	41	14.67	63.3	363.5	126.2
WF 241	181	222	40	12.98	63.6	252.3	154.5
WF 242	184	217	33	13.14	61.5	179.1	135.7
Mean	174.07	215.64	41.57	14.89	63.29	372.26	126.00
CV (%)	0.65	0.93	4.57	2.42	1.02	8.85	6.22
P-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
MSD	3.88	6.94	6.55	1.24	2.21	113.53	26.78

Bold= Highest value or earliest date in column, **Bold**= statistically equal to highest or earliest value in column, HD= Heading Date (days), PM= Physiological Maturity (days), GRNFL= Grain fill (days), Pro= Protein (%), TWT= Test weight (Lbs./Bu), FN= Falling Number (seconds) YLD= Yield (Bu/A)



Project title:

Off-Station Spring Wheat Variety Trial

Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future spring wheat varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel:

D. Larson, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki, H. Heo, J. Cook, J. Jensen

Summary:

25 entries of spring wheat, in three repetitions were planted on 23 April 2025 as a farmer-field trial. This trial was rain fed and harvested on 3 September 2025. Cultural practices are provided in Table 1. This farmer-field trial received 6.6 inches of rain during the growing season.

Mean yield was 92 Bu/A, MT 1939 had the highest (100 Bu/A) and WB 9879CLP was the lowest yielding (79 Bu/A). The mean protein was 13.2%, with WB 222 having the highest protein (15%) and PI 642366 being the lowest (12%). The mean test weight was 63 Lbs./Bu, MT 22083 had the highest (64 Lbs./Bu) and MT 22073 was the lowest (61 Lbs./Bu). The mean heading date was day 177 (26 June) with PI 690450 the earliest (day 176; 25 June) and AGRIPR 161 as the latest (day 178; 27 June).

Table 1. Management Information

Seeding Date:	23 April 2025 (113)	Field Location:	Holt Stage
Seeding Rate:	N/A	Harvest Date:	3 Sep 2025 (246)
Previous Crop:	Commercial Hemp	Soil Type:	Blanchard very fine sandy loam
Herbicide:	Tulvera/ Foliarblend	Tillage:	No-Till
Insecticide:	N/A	Soil Residual Nutrient (N,K, P, Lbs./A):	14, 16, 446
Fungicide:	N/A	Nutrient Fertilizer Applied (N,P,K, Lbs./A):	62-0-15

Table 2. Agronomic Performance

NAME	HD (Days)	DTH (Days)	PRO (%)	TWT (Lbs./Bu)	YLD (Bu/A)
AGRIPR 161	178	65	12.17	63.1	94.5
BZ 917_277	178	65	13.10	62.9	99.5
BZ 92413R	177	64	12.49	63.1	93.3
LIMAGR 211	177	64	12.13	63.8	95.5
MT 1809	177	64	12.88	62.5	98.2
MT 1939	177	64	13.61	62.2	<u>100.5</u>
MT 2030	176	63	13.22	62.2	80.1
MT 21074	178	65	13.28	62.5	87.3
MT 21174	176	63	13.11	62.6	83.0
MT 21484	176	63	13.57	62.9	97.8
MT 21487	177	64	12.90	62.6	87.9
MT 22073	176	63	14.09	60.8	79.7
MT 22083	177	64	13.91	<u>63.8</u>	99.0
MT 22182	177	64	12.87	61.5	98.5
MT 22205	176	63	12.50	62.8	98.6
MT 22345	177	64	12.72	62.4	94.7
ND 695	178	65	13.13	63.7	94.3
NDHRS14_0134_C03	177	64	12.66	61.8	92.1
PI 642366	177	64	12.08	63.1	100.3
PI 676978	177	64	13.45	62.8	92.4
PI 690450	<u>176</u>	<u>63</u>	13.72	63.2	91.8
SYN 182	176	63	13.55	63.5	90.6
SYN 211	178	65	14.23	63.7	81.0
WB 222	177	64	<u>14.92</u>	62.5	84.2
WB 9879CLP	177	64	13.67	62.1	79.0
Mean	176.89	63.89	13.20	62.73	91.75
CV (%)	0.50	1.38	7.67	0.81	14.62
P-value	0.053	0.053	0.150	<0.001	0.678
MSD	2.80	2.80	3.21	1.60	42.47

Bold= Highest value or earliest date in column, **Bold**= statistically equal to highest or earliest value in column, HD= Heading Date (days), DTH= Days to heading (days), GRNFLL= Grain fill (days), Pro= Protein (%), TWT= Test weight (Lbs./Bu), YLD= Yield (Bu/A)

Project Title:

Conventional and Split-application Nitrogen Rate Performance in Elite Spring Wheat Varieties

Objective:

To determine fertilizer rate and timing on yield and quality of spring wheat

Personnel:

Marilyn Dalen, Emily McGarvey, and Jessica Torrion

Summary:

This study was laid out in a randomized complete block design with three replications. The Nitrogen (N) treatment was the main plot. The five elite spring varieties were the subplot. Management information for this study is presented in Table 1.

Results of this two-year study showed a significant yield difference with N application regardless of timing (Figure 1) in relation with the control. Higher yield was obtained with a total N application of 150 and 200 lb/a (residual + applied N) compared to control (residual N).

Fertilizing N increased grain protein. In particular, the split-application treatment '75p + 75h' consistently had the highest grain protein across years and is optimal. In general, falling number increased with N application relative to the control (Figure 3), except '75p + 75h' treatment.

The yield, yield component, and quality of the five elite varieties are presented in Table 2. Among the five elite varieties, Vida obtained the highest grain yield, Egan the highest grain protein content and Dagmar showed the highest test weight and thousand seed weight.

Table 1. Management Information

Seeding date:	4/18/2025 (108 Julian)	Field Location:	R6
Seeding rate:	26 Seeds/ft ²	Harvest date:	8/11/2025 (223 Julian)
Previous crop:	Canola	Soil type:	Creston silt loam
Herbicide:	Axial Bold	Tillage:	Conventional
	Cleansweep	Soil residual nutrient (N, P, K lb/A):	66-8-140 (Fall 2024)
Insecticide:	N/A	Nutrient fertilizer applied (N, P, K lb/A):	Varies by TRT
Fungicide:	N/A		

Table 2. Yield, yield component, and quality of spring wheat in response to different nitrogen rates and timing

Yield, yield component, and quality	Variety				
	Dagmar	Egan	MT Carlson	MT Ubet	Vida
Grain yield (bu/a)	64.5c	61.4d	67.9b	65.1c	73.9a
Grain protein content (%)	15.6b	16.9a	14.8d	14.9c	14.9cd
Test weight (lb/bu)	61.1a	59.4d	59.6d	59.9c	60.8b
1000 seed weight (g)	47.0a	41.3e	45.3b	43.6d	44.4c
Falling number (seconds)	394c	539a	396c	471b	346d

The same letter assignment denotes non-significance at $\alpha=0.05$.

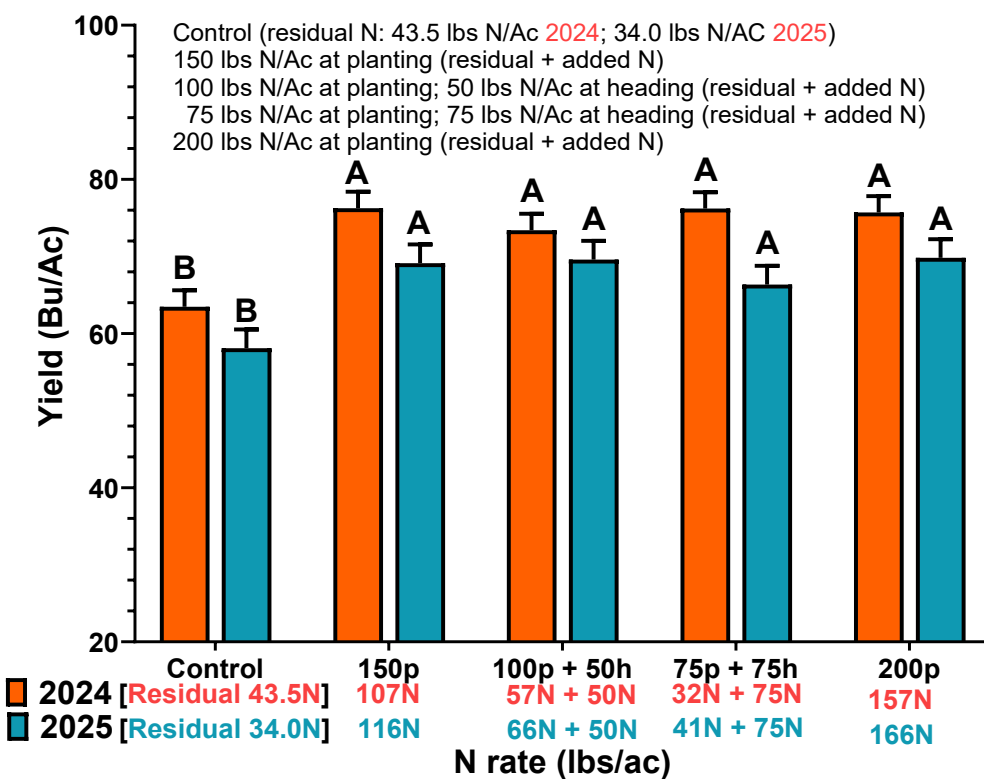


Figure 1. Yield response with N application timing. Actual applied N fertilizer is shown in x-axis by year. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$ within year.

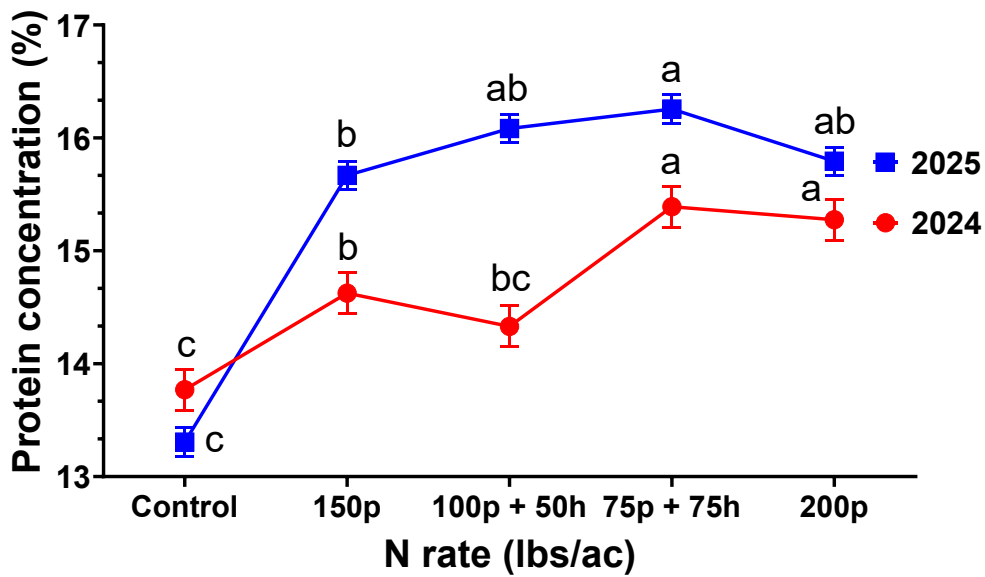


Figure 2. Grain protein concentration with N application timing. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$ within year.

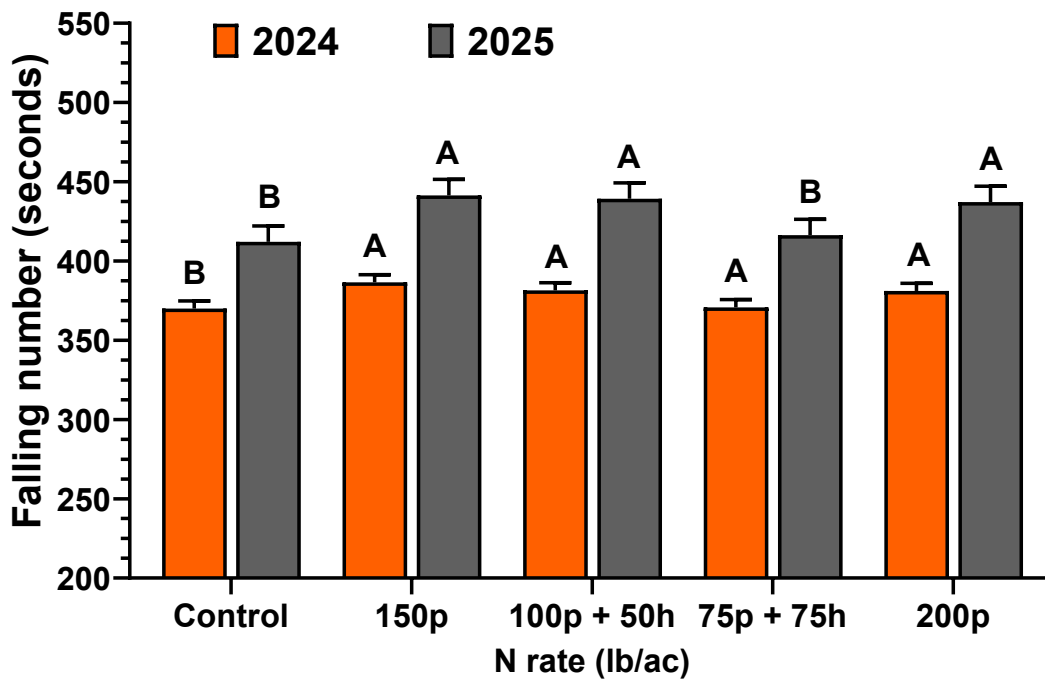


Figure 3. Falling number with N application timing. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$ within year.

Acknowledgements:

We thank farm operations staff J. Penney and A. Goodman, without whom this research could not be successful. We also acknowledge R. Barnes, E. Benson, T. Burkhart, J. Cain, A. Mathison, and E. Schreifels for their assistance with field operations, data collection, and sample processing.

Project Title:

Evaluating the Effects of Silicon and Nitrogen Fertilization on Spring Wheat

Objective:

To establish a Silicon (Si) application source and rate that can optimize wheat grain yield and quality under low and sufficient Nitrogen (N) rates

Personnel:

Marilyn Dalen, Emily McGarvey, and Jessica Torrion

Summary:

This study was laid out in a split-split-plot design replicated three times where the main plot was N treatment; control (residual) and 150 lbs N/ac (residual + added N). The subplots were four Si rates (0, 0.5, 1.0, and 2.0 t/ac). The sub-subplots were three Si sources (Wollastonite, Silicate slag, and volcanic ash). Two varieties (Dagmar and Vida) were completely randomized within the Si source sub-subplot factor. This study was under rainfed (see Table 1 for management information).

Our initial results showed no significant difference for Si source and rate application on grain yield or grain protein of spring wheat (Figures 1, 2, and 3). The significant difference in grain yield and protein content was influenced by Nitrogen application. Our results showed that slag may increase falling number which remains to be verified (Figure 4). Between the two varieties used, Vida showed higher grain yield than Dagmar. However, Dagmar performed better in terms of grain protein, thousand kernel weight, and falling number (Table 2).

No significant effect of Si application was observed in 2025; this can be attributed to an inherently high soil pH (>7.0) at the experimental site. Plants tend to respond to Si application under acidic soil. To verify these results, this study will be established under acidic soil conditions in 2026.

Table 1. Management Information

Seeding date:	4/22/2025 (112 Julian)	Field Location:	R6
Seeding rate:	26 Seeds/ft ²	Harvest date:	8/12/2025 (224 Julian)
Previous crop:	Canola	Soil type:	Creston silt loam
Herbicide:	Axial Bold Cleansweep	Tillage:	Conventional
Insecticide:	N/A	Soil residual nutrient (N, P, K lb/A):	66-8-140 (Fall 2024)
Fungicide:	N/A	Nutrient fertilizer applied (N, P, K lb/A):	Varies by TRT



Photo: Silica application in the spring of 2025, NWARC, Creston, MT

Table 2. Yield, yield component, and quality of spring wheat in response to different Si sources and rates.

Yield, yield component, and quality	Variety	
	Dagmar	Vida
Grain yield (bu/a) ¹	60.8b	69.4a
1000 seed weight (g)	46.6a	43.4b
Grain protein content (%)	14.4a	13.8b
Falling number (seconds)	378.7a	316.8b

Note: The same letter assignment denotes insignificance at $\alpha=0.05$.

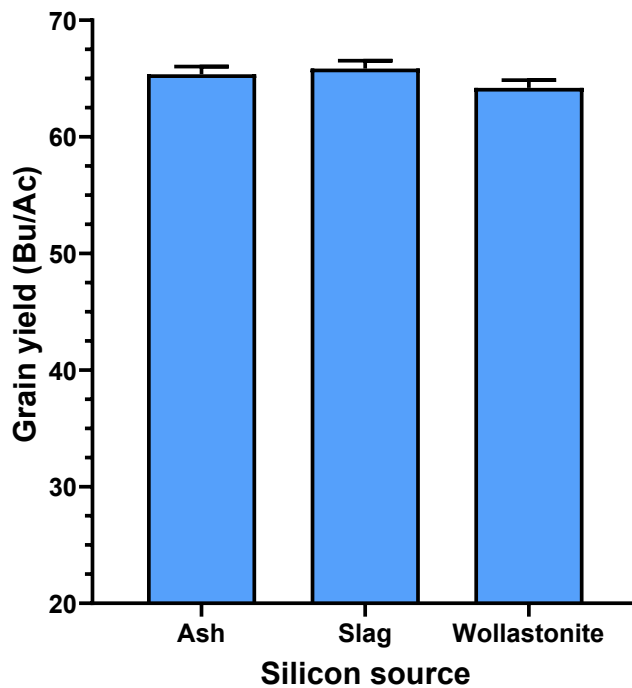


Figure 1. Yield response with different Si source application. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$.

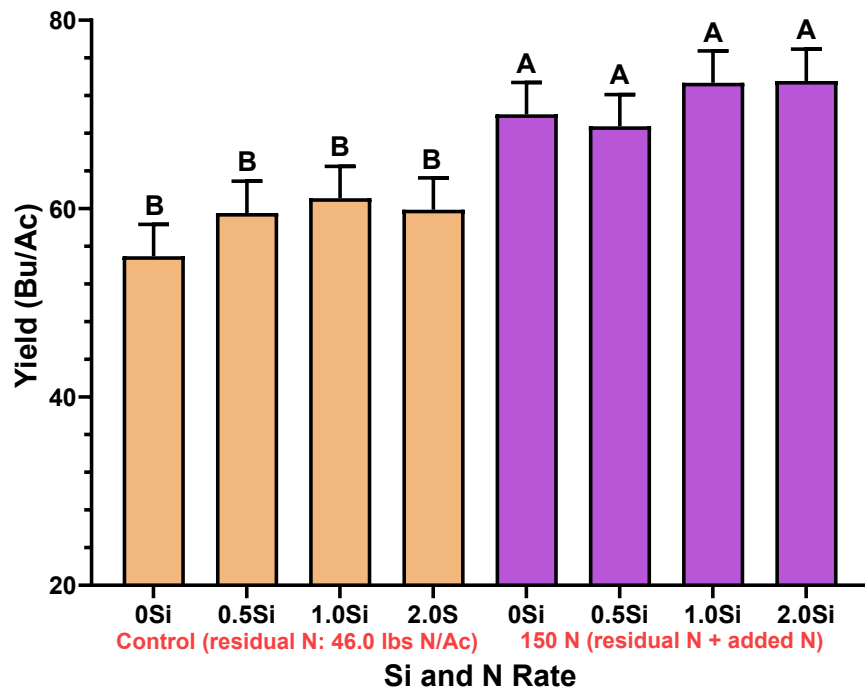


Figure 2. Yield response with Si and N rates. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$.

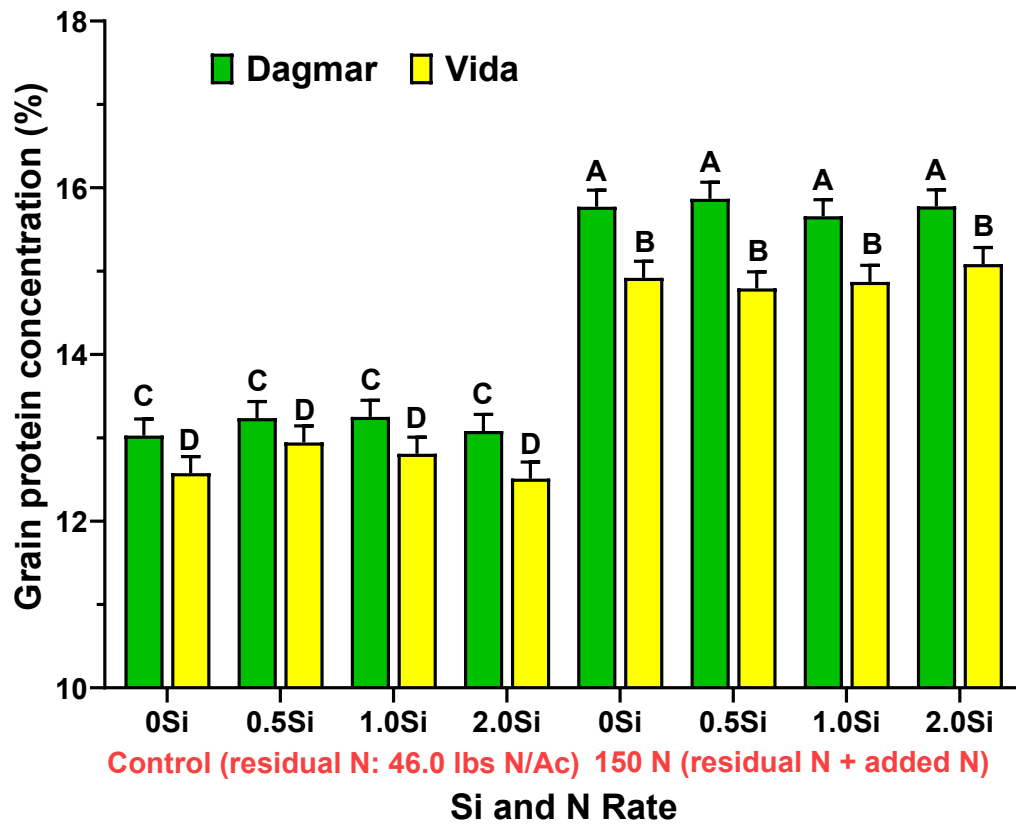


Figure 3. Grain protein concentration response with varying Si and N rates. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$.

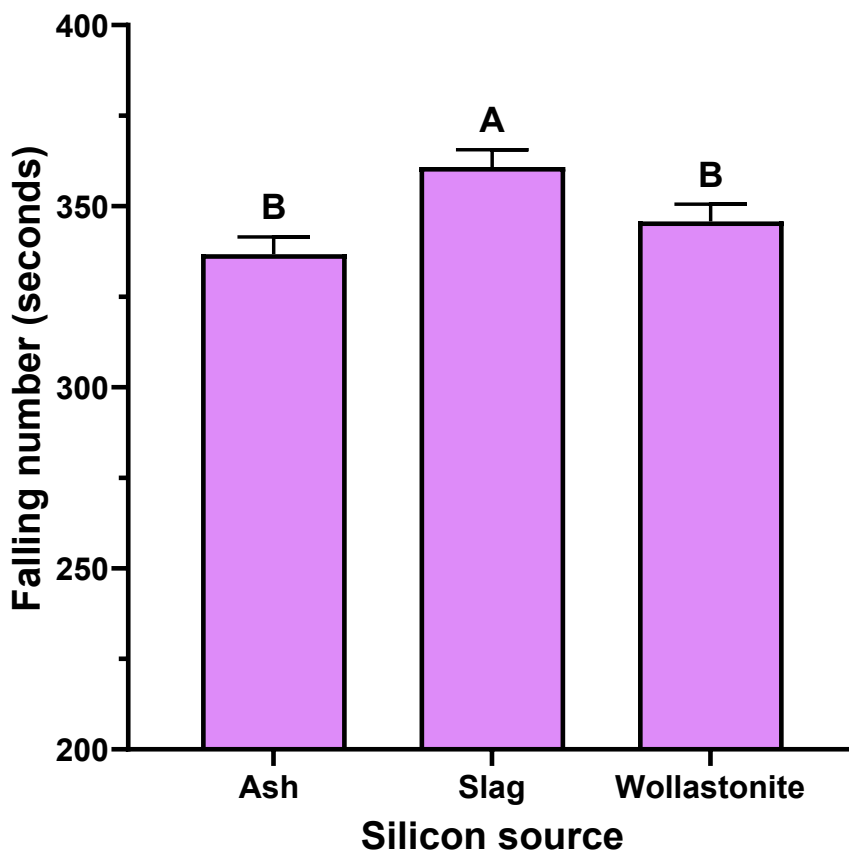


Figure 4. Falling number with varying Si source applications. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$.

Acknowledgements:

We thank farm operations staff J. Penney and A. Goodman, without whom this could not be successful. We also acknowledge R. Barnes, T. Burkhart, J. Cain, A. Mathison, and E. Schreifels for their assistance with field operations, data collection, and sample processing. This study was supported by the Montana Fertilizer Advisory Committee (MFAC).

Project Title:

Optimizing Boron Management for Sustainable Wheat Production and Soil Health in Montana

Objective:

To determine the impact of Boron soil application to improve wheat seed set, yield, and quality under rainfed growing conditions

Personnel:

Marilyn Dalen, Emily McGarvey, and Jessica Torrion

Summary:

This study was laid out in a split-plot design, replicated three times. The main plot factor was the Boron (B) applied as liquid and granular amendments at rates of 0.0, 1.0, 2.0, 3.0 lbs/acre. Five varieties of wheat were the subplot factors. Subplot factors were randomly arranged within the main plot factor. The study was in rainfed conditions (see Table 1 for management information). Plots were monitored for signs of B toxicity, including thickened stems and curled leaves. Three heads were collected from each plot to examine pollen viability at the flowering stage and to analyze amounts of B in the tissue. At physiological maturity, 10 heads were collected and analyzed for seed set, in addition to the standard thousand kernel weight (or seed size), yield, and quality metrics. Soil samples from 0-3, 3-6, 0-6, and 6-12 inches were collected in each block for N, P, K, soil organic carbon (SOC), pH, Mg²⁺, Ca²⁺, and B analysis.

Results showed that there was no significant difference in grain yield with the application of Boron (Table 2). However, numerically, applications of 1 and 2 lbs/Ac of Boron showed numerical grain yield trend to about 4.0 bu/ac with the highest B application showed a diminishing yield trend. The application of 1.0 lb/Ac was the minimum rate that improved grain protein content, thousand kernel weight, test weight, and falling number (Figures 2-5).

All varieties had the same yield and falling numbers above critical levels (Table 2). Dagmar and Lanning had the highest protein. Dagmar outperformed other varieties for test weight and thousand kernel weight.

Table 1. Management Information

Seeding date:	4/22/2025 (112 Julian)	Field Location:	R6
Seeding rate:	26 Seeds/ft ²	Harvest date:	8/18/2025 (225 Julian)
Previous crop:	Canola	Soil type:	Creston silt loam
Herbicide:	Axial Bold Cleansweep	Tillage:	Conventional
Insecticide:	N/A	Soil residual nutrients (N, P, K lb/A):	66-8-140 (Fall, 2024)
Fungicide:	N/A	Nutrient fertilizer applied (N, P, K lb/A):	208-77-161 (at planting)

Table 2. Yield, yield component, and quality of spring wheat in response to different B sources and rates.

Yield, yield component, and quality	Variety				
	Dagmar	Lanning	MT Carlson	MT Ubet	Vida
Grain yield (bu/a) ¹	88.1a	88.1a	88.9a	89.3a	92.0a
Grain protein content (%)	15.4a	15.1a	14.3c	14.6b	14.8b
Test weight (lb/bu)	63.2a	62.9b	61.9e	62.1d	62.7c
1000 seed weight (g)	47.4a	44.9b	45.5b	44.1c	43.6c
Falling number (seconds)	466b	421c	437c	505a	388d

¹Yield data adjusted to 13% moisture.

Note: The same letter assignment denotes non-significance at $\alpha=0.05$.

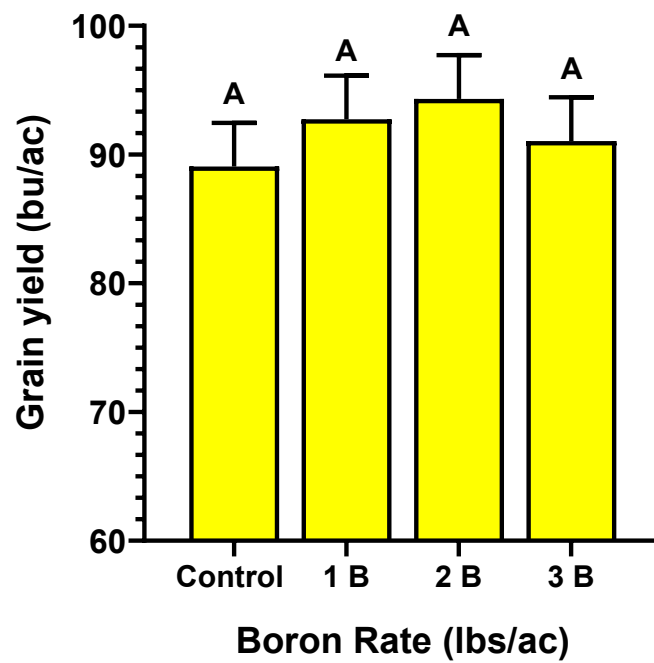


Figure 1. Yield response with Boron application. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$.

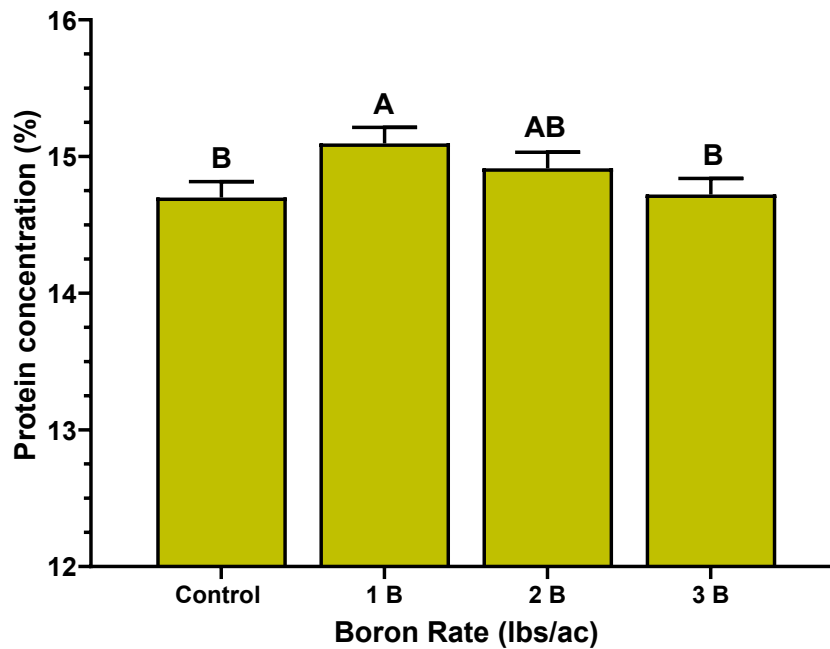


Figure 2. Protein concentration with Boron application. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$.

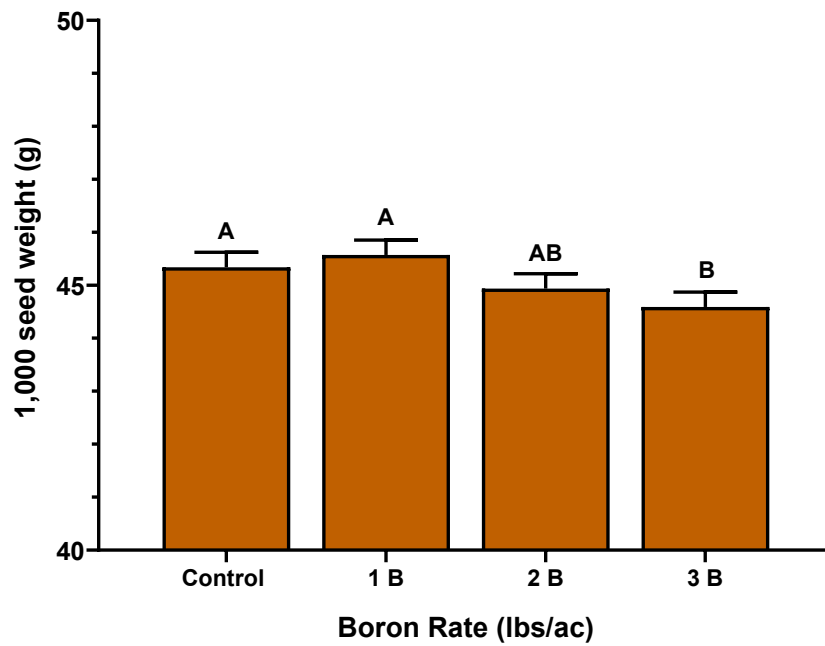


Figure 3. Thousand (1,000) Kernel Weight with Boron application. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$.

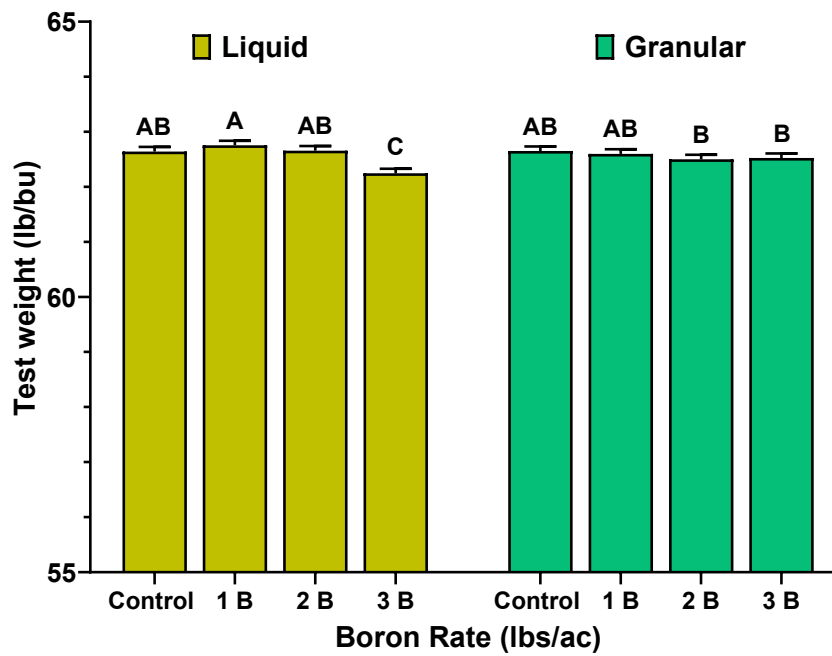


Figure 4. Test weight with Boron application. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$.

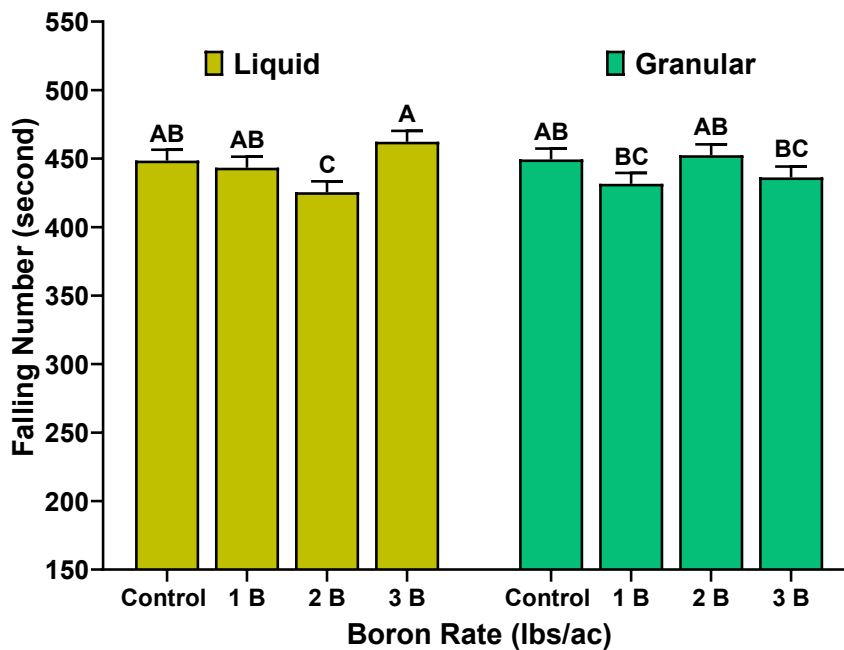


Figure 5. Falling number with Boron application. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$.

Acknowledgements:

We thank farm operations staff J. Penney and A. Goodman, without whom this could not be successful. We also acknowledge R. Barnes, T. Burkhart, J. Cain, A. Mathison, and E. Schreifels for their assistance with field operations, data collection, and sample processing. This study was supported by the Montana Fertilizer Advisory Committee (MFAC).

Project Title:

Growth, Yield and Quality Performance of Six Spring Wheat Entries

Objective:

To determine the growth, yield, and quality performance of six spring wheat entries.

Personnel:

Marilyn Dalen, Emily McGarvey, and Jessica Torrion

Summary:

Six spring wheat entries (EXP21509, Reg Hale, Reg WB9668, WB9303, WB9623, and WSU Bush) were planted at the Northwestern Agricultural Research Center (field management information is presented in Table 1).

Among the six entries tested, WB9623 and WSU Bush produced the highest yields, but had the lowest grain protein concentrations, reflecting the inverse relationship between these traits (Figures 1, 2). In contrast, Reg WB9668 and WB9303 showed the highest grain protein concentrations, but the lowest yields.

There is no significant difference in height and falling number values among entries (Table 2). Reg Hale, and Reg WB9668 had numerically higher falling number values than the rest of the entries (>330 seconds, an economically desirable value). Among the six entries, WB9623 and Reg Hale are the top performers based on the agronomic parameters (Table 2).

Table 1. Field Management Information

Seeding date:	4/22/2025 (112 Julian)	Field Location:	R6
Seeding rate:	24 seeds/ft ²	Harvest date:	8/13/2025 (225 Julian)
Previous crop:	Barley	Soil type:	Creston Silt loam
Herbicide:	Axial Bold	Tillage:	Conventional
	Cleansweep	Soil residual nutrient (N, P, K lb/A):	66-8-140 (Fall 2024)
Insecticide:	N/A	Nutrient fertilizer applied (N, P, K lb/A):	246-77-161 (Spring 2025)
Fungicide:	N/A		

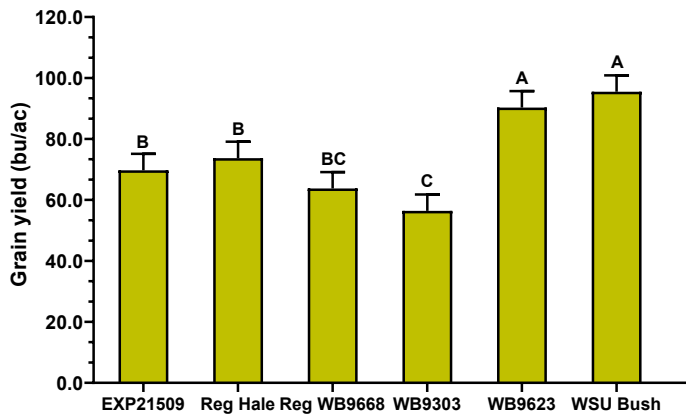


Figure 1. Grain yield of six spring wheat entries. The same letter assignment denotes nonsignificance at $\alpha=0.05$.

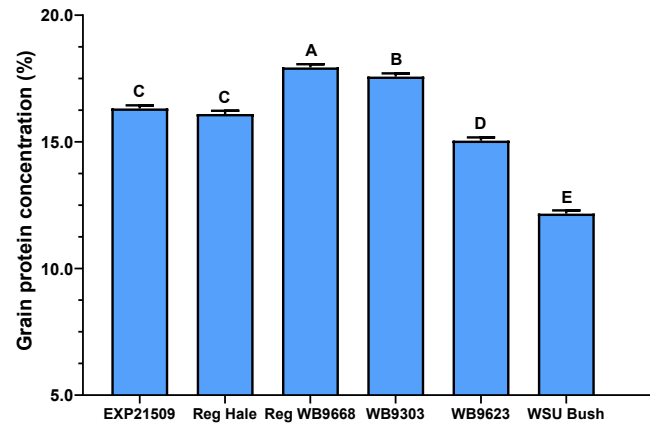


Figure 2. Grain protein concentration of six spring wheat entries. The same letter assignment denotes nonsignificance at $\alpha=0.05$.

Table 2. Agronomic Performance of Six Spring Wheat Entries

Entry	PLNT HT (in)	TWT (lbs/bu)	TKW (g)	FN (seconds)
EXP21509	25.3a	61.0b	45.7c	308a
Reg Hale	25.0a	62.1a	52.2a	341a
Reg WB9668	28.0a	60.6bc	41.5d	343a
WB9303	27.7a	59.5c	45.7c	242a
WB9623	25.0a	61.6ab	50.8ab	296a
WSU Bush	27.1a	62.2a	49.2b	326a
Mean	26.4	61.2	47.5	309
F value	0.70	8.69	44.84	5.01
Pr>F	0.63	0.0004	<0.0001	0.33

Note: Values with the same letter within column are not significantly different at $P<0.05$

PLNT HT: Plant Height, TWT: Test Weight, TKW: Thousand Kernel Weight, FN: Falling Number

Acknowledgements:

We thank farm operations staff J. Penney and A. Goodman, without whom this research could not be successful. We also acknowledge R. Barnes, T. Burkhart, J. Cain, A. Mathison, and E. Schreifels for their assistance with field operations, data collection, and sample processing.

FORAGES

Alfalfa, Winter and Spring Forage Barley, Perennial Grass, Variety Forage

Project title:

Cutting Schedules and Alfalfa Fall Dormancy Impacts on Yield and Quality under Irrigated Conditions.

Objective:

To evaluate the yield and quality of alfalfa cultivars with different fall dormancy ratings (FD 3–7) and cutting schedules under irrigated conditions.

Personnel:

Saurabha Koirala, Marilyn Dalen, Emily McGarvey, and Jessica Torrion

Summary:

The experiment was laid out using a split-plot design with four replications. The cutting schedule was the whole plot factor and included three treatments: bud (harvest at 50% bud stage), 10% flower (harvest at 10% flowering stage), and staggered (the first cut at the bud stage and the second cut at over 50% flowering stage). The subplot factor was the FD ratings of the varieties (3-7). -holding capacity. Total irrigation applied was 8.2 inches in 2024 and 7.2 inches in 2025

In 2024, the bud cutting schedule was cut three times, whereas the other schedules were cut twice. In 2025, the bud and staggered cutting schedules were cut four times, and the 10% flowering schedule was cut three times. Center-pivot irrigation was used based on an estimated daily crop water usage from reference evapotranspiration, rainfall, and soil water holding capacity. Total irrigation applied was 8.2 inches in 2024 and 7.2 inches in 2025 respectively. Dry matter (DM) yield was adjusted to 70% moisture basis to ensure fair comparison among treatments. Management details are provided in Table 1.

Cutting schedules had a modest effect on DM yield in 2024, as the year of establishment. The bud and 10% flower schedule produced similar DM yields, whereas the staggered cutting schedule produced the lowest DM yield (Figure 1). In 2025, the DM yields were more than double

that of 2024. In 2025, the staggered schedule produced greater DM yield, followed by the 10% flower schedule, with bud cutting schedule yielding the least (Figure 1). DM yield responses varied significantly among fall dormancy (FD) varieties and year (significant interactions in Table 2). In 2024, FD3, FD4, and HVX4 were the lowest-yielding group, whereas FD5, FD6, and FD7 produced slightly higher yields. The FD4 variety had the greatest DM yield, whereas FD3, HVX4, FD5, FD6, and FD7 yielded similarly in 2025 (Figure 2). Overall, the staggered cutting schedule and the FD4 variety produced the strongest yield responses under irrigated conditions during the second year of establishment.

Table 1: Management Information

Seeding date:	5/23/2024 (144 Julian)	Field Location:	R4
Seeding rate:	30 seeds per ft ²	Harvest dates:	Varied by TRT
Previous crop:	Winter Wheat	Soil type:	Flathead Fine Sandy Loam
Herbicide:	Buccaneer 24oz/A, Preplant: Triflurex hfp 1pt/A	Tillage:	Conventional
Insecticide:	Crusader 1EC 3.84oz/A	Soil residual nutrients (NO₃-, P, K lb/A):	65-12-123 (Fall, 2023)
Fungicide:	N/A	Nutrient fertilizer applied (N, P₂O₅, K₂O lb/A):	10-60-150 (Spring, 2024)

Table 2: Analysis of Variance for the Main Effects of Cutting Schedule, Varieties, and Year on Alfalfa Dry Matter (DM) Yield.

Effect	Degree of freedom	P-value
Cutting schedule	2	0.013
Varieties	5	<.0001
Cutting schedule * Varieties	10	0.1673
Year	1	<.0001
Year*Cutting schedule	2	<.0001
Year*Varieties	5	<.0001
Year*Cutting schedule *Varieties	10	0.060

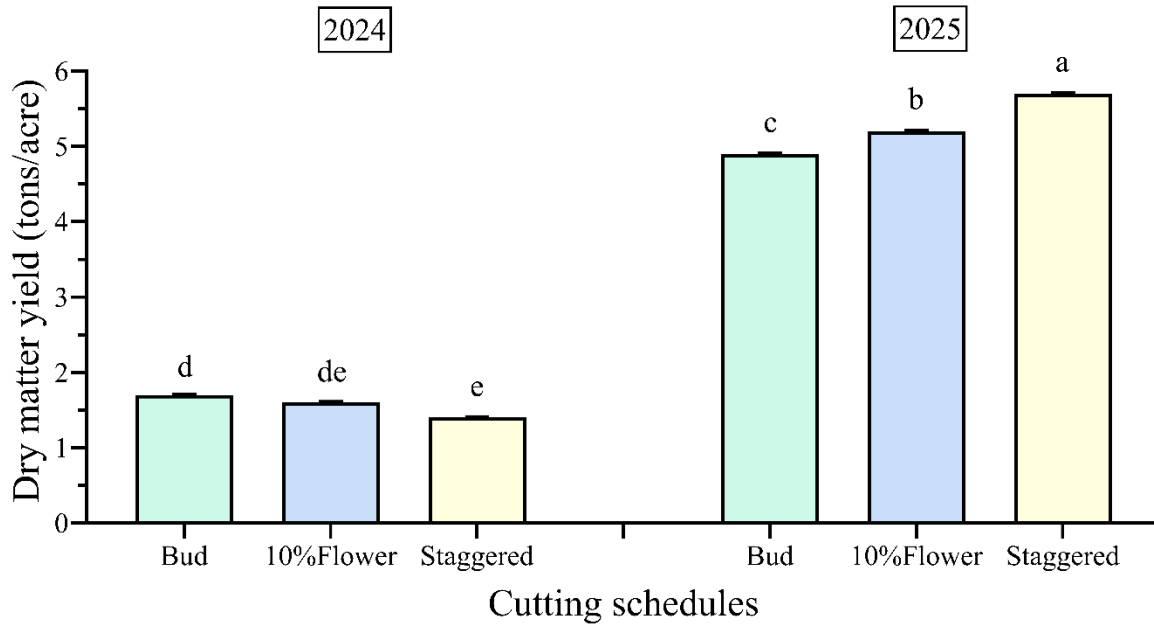


Figure 1. Effect of cutting schedules on dry matter yield, averaged across varieties and cutting events in 2024-2025. Same letter assignment denotes non-significance across cutting schedules and years at $\alpha=0.05$.

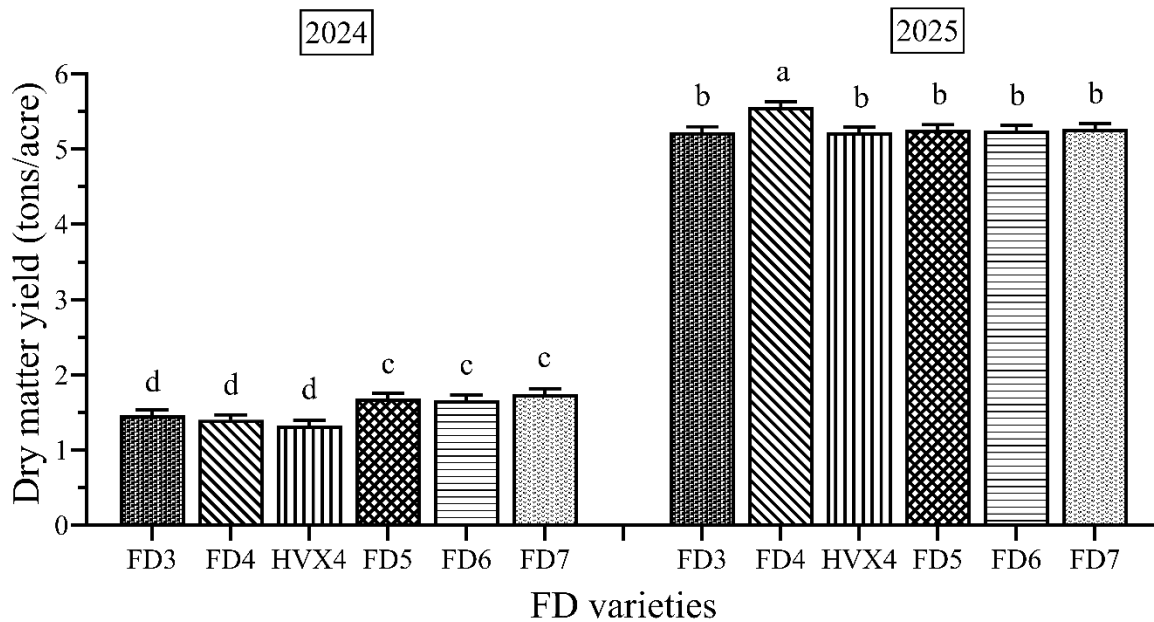


Figure 2. Effect of fall dormancy (FD) varieties on dry matter yield, averaged across cutting schedules and cutting events in 2024-2025. Same letter assignment denotes non-significance across varieties and years at $\alpha=0.05$.

Acknowledgements:

We thank farm operations staff J. Penney and A. Goodman, without whom this research could not be successful. We also acknowledge E. Benson, T. Burkhart, J. Cain, A. Mathison, and E. Schreifels for their assistance with field operations, data collection, and sample processing. This study was supported by the USDA National Institute of Food and Agriculture.

Project title:

Cutting Schedules and Alfalfa Fall Dormancy Impacts on Yield and Quality under Rainfed Environment.

Objective:

To evaluate the yield, and quality of alfalfa cultivars with different fall dormancy ratings (FD 3–7) and cutting schedules under rainfed conditions.

Personnel:

Saurabha Koirala, Marilyn Dalen, Emily McGarvey, and Jessica Torrior

Summary:

The experiment was laid out using a split-plot design with four replications. The cutting schedule was the whole plot factor and included three treatments: bud (harvest at 50% bud stage), 10% flower (harvest at 10% flowering stage), and staggered (the first cut at the bud stage and the second cut at over 50% flowering stage). The subplot factor was the FD ratings of the varieties (3-7). -plot factor and included three treatments: bud (harvest at 50% bud stage), 10% flower (harvest at 10% flowering stage), and staggered (the first cut at the bud stage and the second cut at over 50% flowering stage). The subplot factor was the FD ratings of the varieties (3-7). During establishment year (2024), the bud cutting schedule was harvested three times, including a final cutting

In 2024, the bud cutting schedule was harvested three times, including a final cutting event at frost, whereas the other schedules were harvested twice. In 2025, the bud and staggered cutting schedules were harvested four times, and the 10% flowering schedule was harvested three times. Dry matter (DM) yield of each plot was standardized to 70% moisture. Management information is provided in Table 1.

The two-way interactions between year and cutting schedule were statistically significant ($p = 0.05$) for total seasonal DM yield in alfalfa (Table 2). In 2024, all three cutting schedules produced

similar yields (Figure 1). In 2025, the 10% flower cutting schedule produced the greatest DM yield, followed by the staggered cutting schedule, whereas the bud cutting schedule produced the lowest yield (Figure 1). The interaction between year and FD varieties was also found to be significant for total dry matter yield ($p = 0.05$, Table 2).

In 2024, HxV4 had the lowest yield (Figure 2). In 2025, FD3 and FD4 produced the highest DM yields, while FD7 and HxV4 had the lowest DM yields (Figure 2).

Table 1. Management Information

Seeding date:	5/23/2024 (144 Julian)	Field Location:	R4
Seeding rate:	30 seeds per ft ²	Harvest dates:	Various by TRT
Previous crop:	Winter Wheat Buccaneer 24oz/A,	Soil type:	Flathead fine sandy loam
Herbicide:	Preplant: Triflurex hfp 1pt/A	Tillage:	Conventional
Insecticide:	Crusader 1EC 3.84oz/A	Soil residual nutrients (NO₃-, P, K lb/A):	65-12-123 (Fall, 2023)
Fungicide:	N/A	Nutrient fertilizer applied (N, P₂O₅, K₂O lb/A):	10-60-150 (Spring, 2024)

Table 2: Analysis of variance for the main effects of cutting schedule, varieties, and year on alfalfa dry matter (DM) yield.

Effect	Degree of freedom	P-value
Cutting schedule	2	<.0001
Varieties	5	<.0001
Cutting schedule * Varieties	10	0.330
Year	1	<.0001
Year*Cutting schedule	2	0.011
Year*Varieties	5	<.0001
Year*Cutting schedule *Varieties	10	0.255

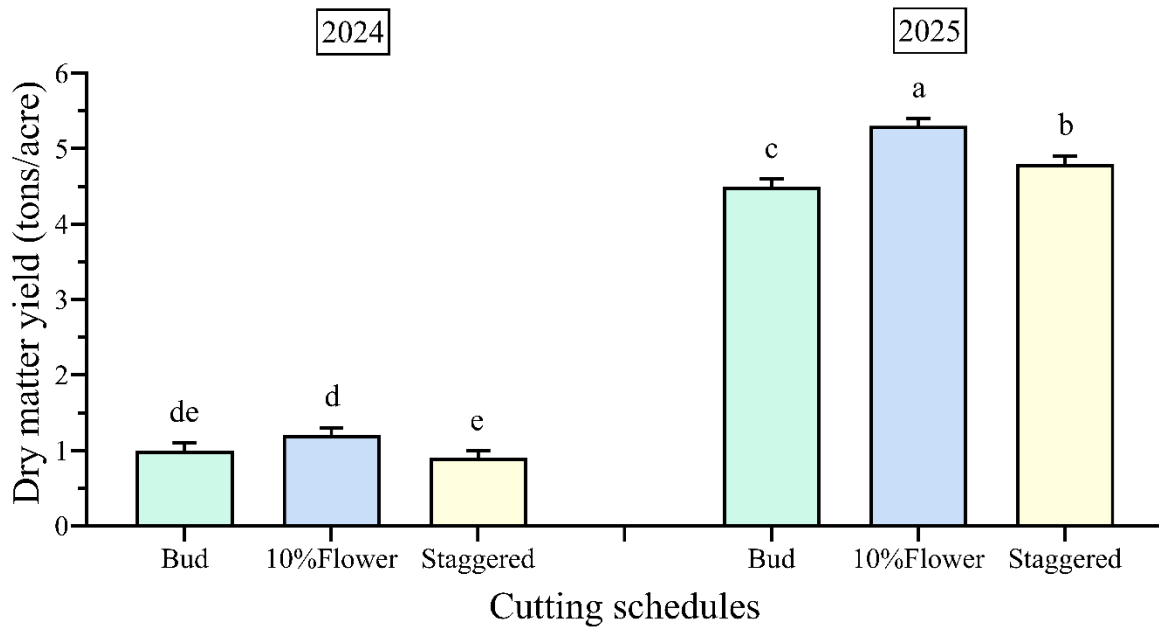


Figure 1. Effect of cutting schedules on dry matter yield, averaged across varieties and cutting events in 2024-2025. Same letter assignment denotes non-significance across cutting schedules and years at $\alpha=0.05$.

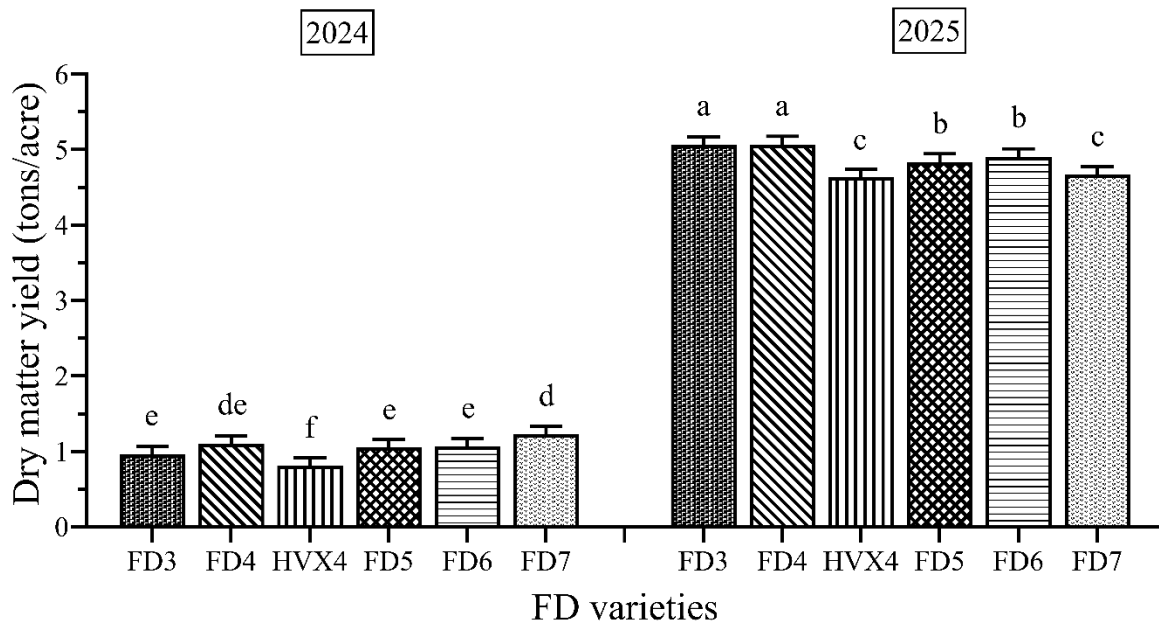


Figure 2. Effect of fall dormancy (FD) varieties on dry matter yield, averaged across cutting schedules and cutting events in 2024-2025. Same letter assignment denotes non-significance across varieties and years at $\alpha=0.05$.

Acknowledgements:

We thank farm operations staff J. Penney and A. Goodman, without whom this research could not be successful. We also acknowledge E. Benson, T. Burkhart, J. Cain, A. Mathison, and E. Schreifels for their assistance with field operations, data collection, and sample processing. This study was supported by the USDA National Institute of Food and Agriculture.

Project title:

Winter Barley Seeding Rate and Fertility

Objective:

Develop seeding rate and fertility recommendations for winter barley in Montana.

Personnel: M. Larson, R. Whitehead, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki, J. Jensen

Summary:

This experiment was conducted at two locations one at Northwestern Agricultural Research Center (NWARC) in Kalispell MT and the other at Central Agricultural Research Center in Moccasin MT. This report is just showing the NWARC data. It was a split-plot design with three replications of nitrogen treatments as the main plot of 0.5x, 1x, and 2x the spring recommended rates of 1.2 Lbs. of N/bushel, while variety (2 forage and 2 feed lines) and seeding rate (17, 23, and 28 plants per square foot) were the subplots. Forage harvest was conducted at soft dough, where a one-meter row from each plot was collected. Samples were dried and weighed to determine biomass and ground to 1mm for NIR quality analysis. Nitrate analysis was performed by DairyLand. Grain was harvested and yield, moisture, test weight, and protein were all collected. See table 1. for management practices.

Table 1. Management Information

Seeding Date:	27-Sep-2024	Field Location:	X4
Seeding rate:	112 Lbs./A, 88 Lbs./A, 64 Lbs./A	Harvest date:	18-Jul-2025
Previous crop:	Production Canola	Soil type:	Creston Silt Loam
Herbicide:	Axial Bold/ Cleansweep	Tillage:	Conventional Tillage
Insecticide:	N/A	Soil residual nutrient (N,P,K Lbs./A):	63-16-278
Fungicide:	N/A	Nutrient fertilizer applied (N,P,K lbs./A):	80-0-0, 97-0-0, 257-0-0

Lines were chosen to vary for yield, biomass, and quality traits and we see this across NWARC (Table 2). Nitrogen treatments did not affect yield in NWARC. This may be because NWARC is already on the higher end of nitrogen recommendations due to high yields, resulting in no yield response (Figure 1). Seeding rates did not improve grain yield, but they did increase biomass (Table 2). We did not see any winter kill in this study so we do not know if increasing seeding rate will improve winter survival. We observed interactions between nitrogen and seeding rates for protein, test weight, and lodging, suggesting that different seeding rates require different nitrogen needs. We also observed differences in lines' responses to nitrogen treatments, primarily impacting quality (protein and test weight).

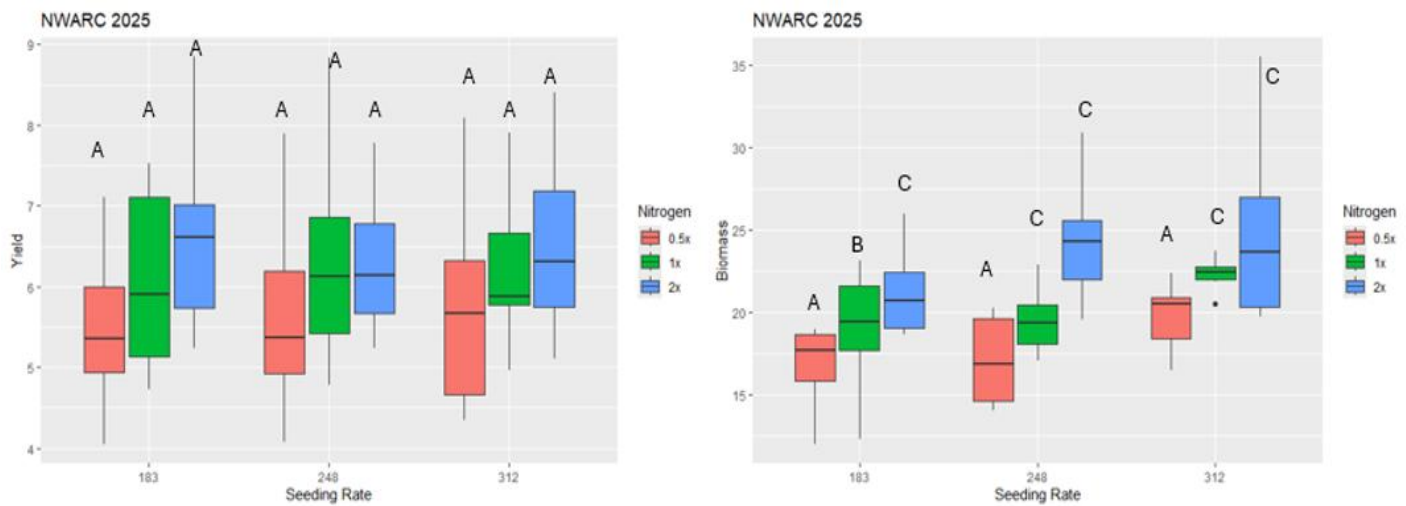


Figure 1: Box and whisker plots comparing the impacts of nitrogen and seeding rate treatments on yield (Mg/hectare) and biomass (Mg/hectare) for NWARC. Letters designate significance levels from Tukey's test using the interaction between nitrogen and seeding rate. Seeding rates were consistent across environments while fertility rates varied based on yield goals, NWARC 1x = 160 lbs. total N.

Table 2: ANOVA for nitrogen (N), barley variety (BV), and seeding rate (SR) along with all interactions. Data was collected during the 2024-25 growing season from two locations.

*Significance codes: ***< 0.001, **<0.01, *<0.05, and .<0.1*

Trait	N	BV	SR	N:BV	N:SR	BV:SR	N:BV:SR
Yield	NS	***	NS	NS	NS	NS	*
Protein	***	***	NS	.	**	NS	NS
Test Weight	***	***	NS	*	*	NS	NS
Lodging	***	**	*	.	**	NS	NS
Biomass	.	NS	*	NS	NS	NS	NS



Project Title:

Winter Barley Forage Early Year Variety Trial

Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future Winter Forage Barley varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel: D. Larson, R. Whitehead, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki, G. Lutgen, J. Sherman, J. Jensen

Summary:

16 entries of winter forage barley, in three repetitions were planted on 27 September, 2024, and harvested on 25 July, 2025. Detailed cultural practices can be found in Table 1. The trial was managed under rain fed conditions and received 15.25 inches of precipitation between planting and harvest.

Mean biomass was 8.93 Tons/A with MTWF7_19-8_2r being the highest (10.3 Tons/A) and MTWF4(F1)_117_2r being the lowest (7.7 Tons/A). Mean protein was 10.8% with MTWF6(F2)_50_1_2r being the highest (12.4%) and Saturn being the lowest (9%). Mean test weight was 50.24 Lbs./Bu with MTWF7_19-8_2r having the highest (52 Lbs./Bu) and MTWF4(F1)_99_6r the lowest (47.9 Lbs./Bu). Mean grain yield was 109.7 Bu/A with Thunder being the highest (156 Bu/A) and MTWF7_19-1_2r the lowest (79.3 Bu/A).

Table 1. Management Information

Seeding Date:	27-Sep-2024 (271)	Field Location:	X4
Seeding rate:	112 Lbs./A	Harvest date:	25-Jul-2025 (206)
Previous crop:	Production Canola	Soil type:	Creston Silt Loam
Herbicide:	Axial Bold, Cleansweep	Tillage:	Conventional Tillage
Insecticide:	N/A	Soil Residual Nutrient (N,P,K Lbs./A):	63-15-131
Fungicide:	N/A	Nutrient Fertilizer Applied (N,P,K Lbs./A):	97-0-0

Table 2. Agronomic Performance

NAME	HD (Days)	PM (Days)	GRNFL (Days)	DM (Tons/A)	PRO (%)	TWT (Lbs./Bu)	YLD (Bu/A)
MTWF7_19-8_2r	<u>144</u>	177	32	<u>10.3</u>	11.3	<u>52.0</u>	106.1
Thunder	138	183	45	9.9	9.8	51.4	<u>156.0</u>
MTWF6(F2)_51_5_2r	140	178	38	9.6	11.1	50.4	104.2
MTWF6(F3)_51-13_6r	144	184	40	9.5	10.5	49.4	115.3
MTWF6(F2)_50-7_2r	142	179	37	9.1	11.5	50.7	86.7
MTWF7_19-1_2r	144	178	34	9.1	12.0	51.0	79.3
MTWF4(F1)_99_6r	138	178	40	9.0	10.7	47.9	102.1
MTWF6(F3)_51-17_2r	143	180	37	9.0	11.0	50.5	119.0
MTWF6(F2)_50_1_2r	141	177	36	9.0	<u>12.4</u>	49.0	86.7
MTWF4(F1)_98_6r	138	180	42	8.8	11.2	49.4	91.9
MTWF7_130-11_2r	143	177	33	8.7	10.3	51.1	119.8
MTWF4(F1)_113_2r	138	178	40	8.6	11.8	49.6	81.8
MTWF4(F1)_129_2r	141	179	37	8.5	10.8	50.5	128.6
MTWF4(F1)_138_6r	141	<u>184</u>	43	8.3	10.1	49.4	120.0
Saturn	138	184	<u>47</u>	7.8	9.0	50.0	147.7
MTWF4(F1)_117_2r	140	177	37	7.7	10.6	51.3	110.4
Mean	140.8	179.5	38.7	8.9	10.9	50.2	109.7
CV %	0.8	0.7	3.4	13.8	2.9	0.8	7.1
P-value	<0.001	<0.001	<0.001	0.6	<0.001	<0.001	<0.001
MSD	3.6	4.0	4.0	3.9	1.1	1.3	25.3

= highest value or latest date in column, = statistically equal to highest or latest value in column HD= heading date (days), PM= physiological maturity (Days), GRNFL= grain fill (Days), LDG= lodging (%), DM= dry matter (Tons/A), HT= Height (cm), PRO= protein (%), TWT= test weight (Lbs./Bu), YLD= yield (Bu/A)



Project Title:

Winter Barley Forage Intrastate Variety Trial

Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future Winter Forage Barley varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel:

D. Larson, R. Whitehead, J. Zimmerly Z. Sippel, E. McGarvey, R. Arakaki
J. Sherman, J. Jensen

Summary:

16 entries of winter forage barley, in three replications were planted on 27 September, 2024, and harvested on 25 July, 2025. Detailed cultural practices can be found in Table 1. They were managed under rainfed conditions and received 15.25 inches of precipitation between planting and harvest.

Mean biomass was 9.68 Tons/A with Saturn being the highest (11.3 Tons/A) and MTWF7_130-11_6r being the lowest (8 Tons/A). Mean test weight was 49.36 Lbs./Bu with Thunder having the highest (51.7 Lbs./Bu) and MTWF7_19-7 the lowest (46.4 Lbs./Bu). Mean protein was 11.44 with MTWF6(F3)_50-11 being the highest (13.3%) protein and Saturn being the lowest (9.5%). Mean grain yield was 99.44 Bu/A with Saturn being the highest (157.3 Bu/A) and MTWF6(F3)_5013 the lowest (60.6 Bu/A). Mean heading date was day 142, 22 May, MTWF7_19-7 had the longest (Day 153, 2 June) and Thunder the shortest (Day 137, 17 May). Mean physiological maturity date was day 181, 30 June, with Saturn having the latest (Day 184, 3 July) and MTWF6(F3)_50-13 the earliest (Day 177, 26 June).

Table 1. Management Information

Seeding Date:	27-Sep-2024 (271)	Field Location:	X4
Seeding rate:	112 Lbs/A	Harvest date:	25-Jul-2025 (206)
Previous crop:	Production Canola	Soil type:	Creston Silt Loam
Herbicide:	Axial Bold, Cleasweep	Tillage:	Conventional Tillage
Insecticide:	N/A	Soil Residual Nutrient (N,P,K Lbs./A):	63-15-131
Fungicide:	N/A	Nutrient Fertilizer Applied (N,P,K lbs./A):	97-0-0

Table 2. Agronomic Performance

NAME	HD (Days)	PM (Days)	GRNFLL (Days)	DM (Tons/A)	PRO (%)	TWT (Lbs./Bu)	YLD (Bu/A)
Saturn	139	184	45	<u>11.3</u>	9.5	49.5	<u>157.3</u>
MTWF6(F2)_50-5	141	179	38	11.1	12.4	49.0	89.9
MTWF6(F3)_50-13	141	177	36	10.5	12.4	49.9	60.6
MTWF7_19-7	<u>153</u>	185	32	10.4	12.3	46.4	88.7
MTWF4(F1)_135_2r	141	179	39	10.1	12.5	49.0	70.5
MTWF4(F1)_95_2r	141	181	40	10.1	10.0	50.6	85.4
MTWF6(F3)_50-11	142	181	39	10.0	<u>13.3</u>	49.7	77.2
MTWF4(F1)_136_6r	138	179	41	9.8	11.9	49.0	103.3
MTWF4(F1)_98_2r	139	177	38	9.8	12.2	49.0	81.2
MTWF4(F1)_123_2r	140	180	40	9.8	11.5	50.6	116.6
MTWF6(F2)_50-2	142	179	37	9.5	11.5	49.1	98.7
MTWF6(F3)_51-10_2r	144	181	37	9.1	11.2	48.9	93.8
MTWF6(F2)_51-5_6r	143	182	39	9.0	10.9	49.0	114.3
MTWF6(F2)_51_9_2r	148	183	36	8.5	11.3	48.1	113.5
Thunder	138	<u>186</u>	<u>48</u>	8.1	9.9	<u>51.7</u>	153.2
MTWF7_130-11_6r	143	177	34	8.0	10.5	50.4	86.8
Mean	142.0	180.6	38.6	9.7	11.4	49.4	99.4
CV (%)	0.6	0.7	4.3	14.6	5.2	1.1	20.3
P-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
MSD	2.4	5.0	5.6	4.3	1.9	1.6	62.9

Underlined= highest value or latest date in column, **bold**= statistically equal to highest or earliest value in column HD= heading date, PM= physiological maturity, GRNFLL= grain fill, LDG= lodging, DM= dry matter, HT= Height, PRO= protein, TWT= test weight, YLD= yield



Project Title:

Intrastate Spring Forage Barley YET Variety Trial

Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future Spring Barley varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel:

D. Larson, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki, G. Lutgen, J. Sherman, J. Jensen

Summary:

45 entries of spring forage barley, in two repetitions were planted on 18 April, 2025 and harvested on 19 August, 2025. This trial was managed under rainfall conditions receiving 7 inches of rain during the growing period. Detailed cultural practices can be found in Table 1.

Mean grain yield was 117 Bu/A with Cowgirl being the highest (169 Bu/A) and MT23_F013_02 the lowest (80 Bu/A). Mean dry matter production was 7 Tons/A with MT23_F012_06 being the highest (10 tons/A) and MT23_F036_04 and MT23_F033_01 the lowest (6 Tons/A). Mean protein was 17% with MT23_F021_08 the highest (18%) and MT23_F004_02 the lowest (15%). Mean test weight was 49 Lbs./Bu, with MT23_F004_02 the highest (52 Lbs./Bu) and MT23_F018_01 the lowest (47 Lbs./Bu).

Table 1. Management Information

Seeding date:	18 April 2025 (108)	Field Location:	R2
Seeding Rate:	N/A	Harvest date:	19 August 2025 (231)
Previous Crop:	Alfalfa	Soil Type:	Creston Silt Loam
Herbicide:	2,4-D	Tillage:	No-Till
Insecticide:	N/A	Soil Residual Nutrient (N-P-K, Lbs./A):	98.5-6-102
Fungicide:	N/A	Nutrient Fertilizer Applied (N-P-K, Lbs./A):	26-45-100

Table 2. Agronomic Performance

NAME	HD (Days)	DM (Tons/A)	GRNFL (Days)	PRO (%)	TWT (Lbs./Bu)	YLD (Bu/A)
Cowgirl	170	6.1	37	17.07	49.4	<u>168.7</u>
Haymaker	172	6.4	35	17.27	50.0	116.8
Lavina	170	7.1	36	16.85	48.5	134.7
MT Double Barrel	175	6.3	31	16.77	49.0	111.0
MT23_F001_01	176	6.8	31	16.88	49.1	117.0
MT23_F001_03	175	6.0	32	16.55	48.6	100.0
MT23_F003_08	173	6.8	34	17.18	48.7	110.5
MT23_F004_02	<u>169</u>	6.8	<u>37</u>	14.90	<u>51.7</u>	125.7
MT23_F005_01	172	6.4	35	17.34	49.6	133.9
MT23_F009_08	175	7.4	31	17.24	50.4	117.1
MT23_F009_12	176	8.5	31	16.52	49.1	90.5
MT23_F010_01	175	7.3	32	16.44	50.8	133.2
MT23_F010_04	174	6.9	32	16.74	50.7	127.4
MT23_F011_07	175	6.7	31	15.97	50.1	113.3
MT23_F011_14	177	6.8	29	16.37	47.5	113.9
MT23_F012_03	176	6.3	31	16.40	51.1	85.0
MT23_F012_06	175	<u>9.9</u>	31	16.81	50.2	111.2
MT23_F012_12	176	7.1	31	16.24	48.4	128.0
MT23_F013_02	176	6.7	31	17.12	49.3	79.7
MT23_F014_05	174	7.3	32	17.45	47.5	115.5
MT23_F015_04	173	6.1	34	16.13	49.0	115.7
MT23_F016_06	175	8.7	31	16.93	50.5	135.0
MT23_F017_05	172	6.5	35	16.45	47.9	109.0
MT23_F018_01	175	6.7	31	16.06	47.1	101.1
MT23_F020_04	172	6.5	35	15.34	50.0	156.7
MT23_F021_08	170	6.5	36	<u>17.75</u>	48.5	107.2
MT23_F022_08	176	7.3	31	17.28	49.5	100.6
MT23_F024_09	173	6.0	34	16.94	48.4	122.1
MT23_F026_12	172	6.7	35	16.31	49.0	118.2
MT23_F027_03	176	7.0	30	16.77	49.9	109.4

Table 2. Agronomic Performance continued

NAME	HD (Days)	DM (Tons/A)	GRNFLL (Days)	PRO (%)	TWT (Lbs./Bu)	YLD (Bu/A)
MT23_F029_01	172	6.1	34	16.96	48.2	152.5
MT23_F029_06	174	7.1	32	16.17	48.3	104.7
MT23_F030_03	172	6.8	34	17.50	49.3	114.8
MT23_F031_02	175	6.6	32	16.56	48.4	115.2
MT23_F032_02	175	7.5	32	17.02	49.4	115.4
MT23_F032_04	175	6.4	32	16.77	49.6	121.0
MT23_F033_01	173	5.9	34	17.66	48.0	112.4
MT23_F033_05	175	7.0	32	16.88	48.7	116.5
MT23_F034_01	174	6.4	32	17.11	49.0	116.2
MT23_F034_03	174	8.6	32	16.34	47.8	145.3
MT23_F035_01	175	6.6	32	16.52	47.6	86.0
MT23_F035_02	174	6.5	32	17.04	47.9	102.2
MT23_F035_03	172	7.2	35	16.62	47.6	121.9
MT23_F036_04	173	6.9	34	17.04	48.0	115.7
MT23_F036_14	170	5.9	36	16.85	48.4	127.3
Mean	173.5	6.9	32.5	16.7	49.0	117.2
CV (%)	1.01	21.91	5.40	2.50	1.40	14.94
P-value	0.001	0.975	0.001	<0.001	<0.001	0.01
MSD	7.4	6.4	7.4	1.8	2.9	74.1

Underline= Highest value or earliest date in column, **Bold**= Statistically equal to highest or earliest value in column, HD= Heading Date (days), DM= dry matter (Tons/A), GRNFLL= Grain fill (days), PRO= Protein (%), TWT= test weight (Lbs./Bu), YLD= Yield (Bu/A)



Project Title:

Intrastate Spring Forage Barley AYT Variety Trial

Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future Spring Barley varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel:

M. Larson, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki, G. Lutgen, J. Sherman, J. Jensen

Summary:

25 entries of spring forage barley, in three repetitions, were planted on 18 April, 2025 and harvested on 15 August, 2025. Detailed cultural practices can be found in Table 1. It was managed under rainfall conditions receiving 7 inches of rain during the growing period.

Mean grain yield was 93 Bu/A with MT20_F097_01 being the highest (125 Bu/A) and MT22_F007_29 the lowest (59 Bu/A). Mean test weight was 50 Lbs./Bu, with MT22_F001_09 the highest (52 Lbs./Bu) and MT21_F005_10 the lowest (48 Lbs./Bu). Mean dry matter production was 5 Tons/A with MT20_F097_01 being the highest (6 tons/A) and MT22_F007_29 the lowest (4 tons/A). Mean protein was 16% with Haymaker the highest (18%) and MT22_F007_02 the lowest (15%). Mean heading date was day 172, 21 June, with MT22_F005_03 being the earliest (day 170; 19 June) and MT22_F001_15, the latest (day 175; 24 June). Mean grain fill was 34 days with MT22_F005_03 the longest (36 days) and MT21_F004_01 the shortest (31 days).

Table 1. Management Information

Seeding date:	18-Apr-25 (108)	Field Location:	R2
Seeding Rate:	N/A	Harvest date:	15-Aug-25 (227)
Previous Crop:	Alfalfa	Soil Type:	Creston Silt Loam
Herbicide:	2,4-D	Tillage:	No-Till
Insecticide:	N/A	Soil Residual Nutrient (N-P-K, Lbs./A):	98.5-6-102
Fungicide:	N/A	Nutrient Fertilizer Applied (N-P-K, Lbs./A):	26-45-100

Table 2. Agronomic performance

NAME	HD (Days)	DM (Tons/A)	XANT (1-10)	GRNFLL (Days)	PRO (%)	TWT (Lbs./Bu)	YLD (Bu/A)
Cowgirl	173	5.4	1.3	33	17.2	49.0	108.7
Haymaker	171	5.4	1.3	35	<u>17.6</u>	49.8	100.4
Lavina	173	5.4	2.7	33	17.0	48.6	83.0
MT Double Barrel	173	4.5	2.0	33	16.7	50.3	97.6
MT20_F097_01	173	<u>6.4</u>	3.0	33	15.8	51.1	<u>124.6</u>
MT20_F099_05	175	5.7	3.0	31	17.1	51.8	112.4
MT20_F108_13	174	4.8	2.0	33	17.2	50.2	89.0
MT20_F109_08	171	5.0	1.7	35	16.1	50.6	100.7
MT20_F109_22	171	5.7	2.0	35	16.7	48.6	99.2
MT20_F110_19	173	5.1	1.0	33	16.7	48.7	93.4
MT21_F003_05	172	5.3	2.0	34	16.6	48.5	99.2
MT21_F004_01	175	5.0	3.3	31	16.8	49.9	78.9
MT21_F005_10	173	5.4	1.3	33	17.0	47.7	92.0
MT22_F001_09	171	5.4	2.3	35	15.8	<u>52.2</u>	85.8
MT22_F001_15	175	5.2	2.3	31	16.9	49.5	89.1
MT22_F002_08	173	5.5	1.7	33	16.9	49.2	102.0
MT22_F003_09	172	5.4	2.7	34	15.5	51.0	117.5
MT22_F004_04	173	5.5	2.3	33	16.3	50.1	80.3
MT22_F005_03	<u>170</u>	5.2	2.0	<u>36</u>	17.1	50.0	82.0
MT22_F005_14	172	5.3	<u>4.7</u>	34	16.7	49.6	85.1
MT22_F007_02	171	4.9	1.7	35	14.6	48.7	94.3
MT22_F007_27	171	5.6	3.0	35	15.8	49.7	80.1
MT22_F007_29	174	4.4	3.0	32	15.4	48.6	59.5
MT22_F008_05	170	4.6	1.7	36	17.0	50.3	74.0
MT22_F009_15	171	5.5	2.3	35	17.1	50.0	85.4
Mean	172.43	5.26	2.25	33.59	16.55	49.75	92.57
CV (%)	1.58	15.58	61.27	8.11	2.85	1.85	22.11
P-value	0.59	0.76	0.05	0.60	<0.001	<0.001	<0.001
MSD	8.65	2.59	4.37	8.62	1.49	2.92	64.82

Underlined= Highest value or earliest date in column, **Bold**= Statistically equal to highest or earliest value in column, HD= Heading Date (days), DM= dry matter (Tons/A), XANT= Xanthomonas (Severity 1-10) PM= physiological maturity (days), Pro= Protein (%), TWT= test weight (Lbs./Bu), YLD= Yield (Bu/A)

Project Title:

Nitrogen Requirement for Sustained Yield and Optimal Quality of Cool-Season Perennial Forages

Objective:

To test Nitrogen (N) requirements, yield, and quality of selected cool-season perennial grass forages.

Personnel:

Marilyn Dalen, Emily McGarvey, Hayes Goosey, Peggy Lamb, and Jessica Torrión

Summary:

Cool-season perennial grasses were planted on April 21st, 2022. N treatments were applied only in 2022. Treatment N4 (50 lbs N/Acre at tillering and 50 lbs N/Acre after first cut) was reapplied in 2025. (See Tables 1 and 2 for detailed management and fertilizer information.)

This study was irrigated and under a split-plot design where four N treatment levels were the main plots (Table 2), and four forage species were the subplots. In 2025, 8 inches of irrigation were applied. Four years of data are presented.

Forage yield responded significantly with N application across the four years of study (Figure 1). Forage yield increased with higher N rates applied per treatment where the 50 + 50 lb N/Acre produced the greatest yield except in 2024. Average annual forage yields were 1.7, 5.1, 3.9, and 3.5 tons/acre in 2022, 2023, 2024, and 2025, respectively. Yield in the second year (2023) was approximately three times that of the establishment year (2022) and declined in years three and four (2024–2025). Reapplication of 50 + 50 lb N in 2025 increased forage production relative to 2024. Among the perennial forage species tested, the dryland mix produced the highest yield across the years (Figure 2).

Nitrate levels significantly increased with increasing N applications, which is evident in the first year of establishment (2022) indicated in Figures 3 and 4. Nitrate levels decreased during subsequent years even with the reapplication of 180 lbs N to the N4 treatment in 2025. Among the grass entries, the dryland mix obtained the highest forage Nitrate level (Figure 4). Overall, Nitrate levels remained within safe levels (<300 ppm).

Forage quality data is presented in Table 3.

Table 1. Field Management Information

Seeding date:	April 21st, 2022 (111 Julian)	Field Location:	R3
Seeding rate:	Variety Dependent		
Previous crop:	Canola	Soil type:	Creston Silt Loam
Herbicide:	Detonate Cleaver (6/7/2022)	Tillage:	Conventional
Insecticide:	N/A	Soil residual nutrient (N, P, K lb/A) in 2022:	40-14-260
Fungicide:	N/A	Nutrient fertilizer applied (N, P, K lb/A) Fall 2022:	Varied - 20.2 - 14.9
Harvest Dates:	Cut 1: June 16, 2025 Cut 2: September 22, 2025		

Table 2. Fertilizer treatments

Treatment ID	N Treatments applied in 2022 (no application in 2023 & 2024)
N1	Control
N2	50 lbs N/Acre at planting
N3	25 lbs N/Acre at tillering + 25 lbs N/Acre after first cut
N4	50 lbs N/Acre at tillering + 50 lbs N/Acre after first (reapplied in 2025)

Table 3. Forage quality (dry basis) of perennial grass species for 2025. The same letter assignment within cuttings denotes insignificance at $\alpha=0.05$.

Forage Quality	Cut 1				Cut 2			
	Dryland Mix	Meadow Brome	Smooth Brome	Tall Fescue	Dryland Mix	Meadow Brome	Smooth Brome	Tall Fescue
Crude Protein	7.3ab	6.3c	6.9b	7.7a	7.8b	5.8d	8.9a	6.8c
ADF	35.7c	37.5a	36.6b	34.5d	37.1b	43.7a	37.3b	34.4c
NDF	62.8a	64.0a	63.8a	60.0b	59.7b	61.4a	53.1d	56.1c
RFV	90.9b	86.9c	88.3bc	96.6a	93.5b	83.3c	105.0a	103.2a
NFC	20.5a	21.4a	20.9a	22.0a	17.2c	15.2d	19.2b	20.6a
WSC	14.9b	14.8b	14.5b	16.0a	12.4b	9.8c	12.3b	14.3a
Starch	1.7b	2.0a	2.0a	1.9a	1.1a	0.1c	0.7b	0.8b

ADF – Acid Detergent Fiber; NDF – Neutral Detergent Fiber; RFV – Relative Feed Value; NFC – Non-Fiber Carbohydrates ; WSC – Water Soluble Carbohydrates

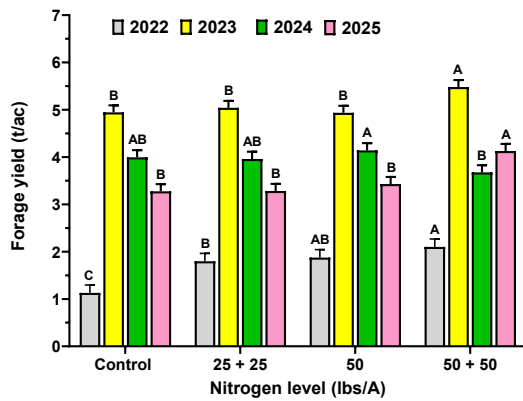


Figure 1. Forage yield (30% dry matter) from 2022-2025 with N levels. Fertilizer was applied in 2022 and reapplied 50+50 lbs N/Acre in 2025. The same letter assignment denotes non-significance at $\alpha=0.05$ within each year.

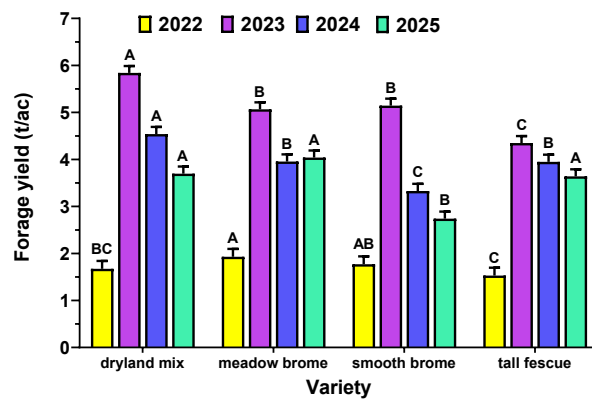


Figure 2. Forage yield (30% dry matter) from 2022-2025 with each grass species. The same letter assignment denotes non-significance at $\alpha=0.05$ within each year.

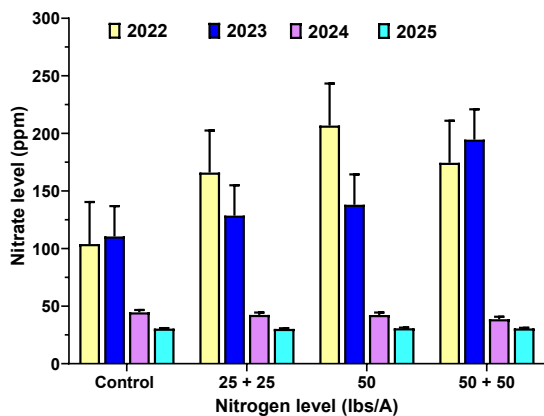


Figure 3. Forage Nitrate levels from 2022-2025. Fertilizer was applied in 2022. 50lbs +50 lbs N/Acre reapplied in 2025. The same letter assignment denotes non-significance at $\alpha=0.05$ within each year.

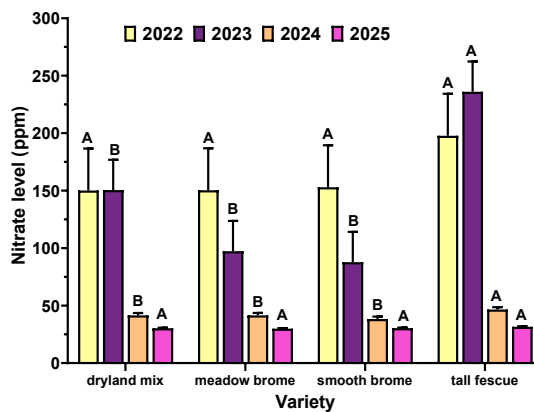


Figure 4. Forage Nitrate levels from 2022-2025 across each grass species. The same letter assignment denotes non-significance at $\alpha=0.05$ within each year.

Acknowledgements:

We thank farm operations staff J. Penney and A. Goodman, without whom this research could not be successful. We also acknowledge T. Burkhart, A. Mathison, and E. Schreifels for their assistance with field operations, data collection, and sample processing.

Project Title:

Winter Cereal Forage Variety Trial

Objective:

To test forage yield, grain yield, and quality of thirteen winter cereal forages

Personnel:

Marilyn Dalen, Emily McGarvey, McKenna Volkman, Jessica Torrion, and Patrick Carr

Summary:

Thirteen cereal forage entries were tested in a randomized complete block trial replicated four times in 2025. These forages were primarily wheat entries as well as rye and triticale (for detailed management information, see Table 1).

Forage yield average was 4.91 tons/A; the highest performer was Rye KWS Aviator2 at 6.92 tons/A.

Plant height ranged from 33.1 in. (Ray) to 59.3 in. (KWS Aviator). Grain protein averaged 11.9%; the highest value was Willow Creek wheat at 13.5%. The highest value for test weight was MT Cash at 65.1 lb/bu (Table 2). MTF24435 had the highest grain yield (157.8 bu/A). Willow Creek had the lowest (79.2 bu/A).

Table 1. Management Information

Seeding date:	10/10/2024 (284 Julian)	Field Location:	X5
Seeding rate:	20 plants/ft ²	Harvest dates:	Forage— 6/19/2025 (170 Julian) Grain — 8/6/2025 (218 Julian)
Previous crop:	Canola Axial Bold	Soil type:	Creston Silt Loam
Herbicide:	Cleansweep Beyond	Tillage:	Conventional
Insecticide:	N/A	Soil residual nutrient: (N, P, K lb/A):	107.5-16-278 (Fall 2024)
Fungicide:	N/A	Nutrient fertilizer applied: (N, P, K, S lb/A):	10-50-80-10 (Fall 2024)

Table 2. Agronomic Data, NWARC, Kalispell, MT

Entries	Crop	PLNT HT (in)	HD Date (Julian)	Forage Moisture (%)	Forage Yield (tons/A)	Crude PRO (%)	ADF (%)	NDF (%)	DDM (%)	RFV (%)
Willow Creek	Wheat	48.3	167.0	71.8	4.35	10.4	42.9	72.1	55.5	72.1
Ray	Wheat	33.1	161.5	72.2	4.31	12.4	37.1*	65.1	60.0*	85.0
MT Cash	Wheat	41.4	160.0	71.0	5.60	10.7	40.3	13.0	57.5	78.0
MTF22136	Wheat	37.2	160.0	67.4	4.46	10.7	37.4	64.8	59.8	85.7*
MTF23410	Wheat	41.3	163.0	72.9	4.78	10.1	41.3	69.4	56.8	75.9
MTF24401	Wheat	39.2	163.0	72.8	4.64	11.9	39.8	68.9	57.9	78.6
MTF24403	Wheat	48.1	167.0	75.4*	4.48	10.7	41.8	70.8	56.4	74.3
MTF24426	Wheat	41.4	163.3	73.8	4.81	13.3*	38.1	66.0	59.2	83.8
MTF24435	Wheat	33.2	162.5	73.8	4.00	12.3	37.6	65.9	59.6	84.4
KWS Aviator ²	Rye	59.3*	147.0*	66.4	6.92*	9.2	39.3	66.4	58.3	81.4
KWS Progas ²	Rye	53.5	147.0*	65.1	5.25	10.9	37.9	64.6*	59.4	85.2
FX1001	Triticale	50.0	160.0	70.3	5.31	11.9	39.8	70.0	58.0	76.4
Mean		43.8	160.0	71.1	4.91	11.2	39.4	67.7	58.2	80.1
CV%		5.9	0.9	1.4	14.3	12.1	3.9	2.8	2.1	5.1
LSD (0.05) ¹		3.7	2.0	1.4	1.01	1.9	2.2	2.7	1.7	5.8
P-value		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

HT- Height; HD- Heading; PRO- Protein; ADF – Acid Detergent Fiber; NDF – Neutral Detergent Fiber; DDM- Digestible Dry Matter;
RFV – Relative Feed Value

Bold* = top performer within a column; **Bold** = equivalent to top performer within a column

¹ Fisher's protected LSD not significant when P-Value > 0.05

Table 2. Agronomic Data, NWARC, Kalispell, MT (continued)

Entries	Crop	Grain Moisture (%)	Grain Yield (bu/A)	Grain PRO (%)	Grain TWT (lbs/bu)	LOD %, if present	Rust %, if present
Willow Creek	Wheat	6.6	79.2	13.5*	63.8	91	15
Ray	Wheat	7.2	140.3	11.3	63.5	0	25
MT Cash	Wheat	6.9	128.1	13.0	65.1*	3	0
MTF22136	Wheat	7.0	141.8	12.5	63.1	19	0
MTF23410	Wheat	7.0	133.5	11.3	64.1	65	0
MTF24401	Wheat	7.0	135.3	10.3	62.3	78	63
MTF24403	Wheat	6.9	86.5	12.2	62.6	89	26
MTF24426	Wheat	7.0	119.6	10.6	62.0	88	100
MTF24435	Wheat	7.3*	157.8*	11.1	63.1	8	0
KWS Aviator2	Rye	-	-	-	-	0	0
KWS Progas2	Rye	-	-	-	-	0	0
FX1001	Triticale	6.3	102.7	13.0	60.3	79	0
Mean		6.9	122.5	11.9	63.0		
CV%		3.2	8.6	4.9	1.0		
LSD (0.05) ¹		0.32	15.4	0.84	0.88		
P-value		<0.01	<0.01	<0.01	<0.01		

PRO- Protein; TWT- Test weight; LOD- Lodging

Bold* = top performer within a column; **Bold** = equivalent to top performer within a column

¹ Fisher's protected LSD not significant when P-Value > 0.05; ² Grain not harvested for these lines at the request of industry supplier

Acknowledgements

We thank farm operations staff J. Penney and A. Goodman, without whom this research could not be successful. We also acknowledge J. Cain, A. Mathison, and E. Schreifels for their assistance with field operations, data collection, and sample processing.

Project Title:

Intrastate Spring Cereal Forage Variety Trial

Objective:

To test forage yield, and quality of twelve spring cereal forages

Personnel:

Marilyn Dalen, Emily McGarvey, McKenna Volkman, Jessica Torrion, and Patrick Carr

Summary:

Twelve cereal forage entries (eight barley, three oats, and one triticale) were tested in a randomized complete block trial replicated four times (for detailed management information, see Table 1).

Forage quality is presented in Table 2. Forage yield ranged from 5.9 t/A (MT20_F099_05) to 8.0 t/A (Oats, Haymaker, and MT20_F109_08). Haymaker, SD Titan and Goliath averaged the highest forage yields values, however they were not statistically different from each other. MT20_F099_05 had the lowest forage yield value (Figure 1).

Plant height ranged from 36 in. (MT Double Barrel) to 58 in. (SD Momentum) (Figure 2). Lodging was only observed for the barley entries where Lavina had the lowest percentage, and the rest were greater than 50% (Figure 3).

Table 1. Management Information

Seeding date:	4/28/2025 (118 Julian)	Field Location:	R9
Seeding rate:	20 plants/ft ²	Harvest date:	Forage harvest 7/28/25 (209 Julian)
Previous crop:	Fallow (2023 Canola)	Soil type:	Flathead Fine Sandy Loam
Herbicide (rate):	Cleansweep	Tillage:	Conventional
Insecticide:	N/A	Soil residual nutrient (N, P, K, S lb/A):	142.5-18-448-68 (Fall 2024)
Fungicide:	N/A	Nutrient fertilizer applied (N, P, K, S lb/A):	100-35-10-5 (Spring 2025)

Table 2. Agronomic Performance, NWARC, Kalispell, MT

Cultivar	Crop	PLNT		LOD (%)	Forage		Crude				
		HT (in)	HD Date (Julian)		MC (%)	YLD (tons/ac)	PRO (%)	ADF (%)	NDF (%)	DDM (%)	RFV (%)
Lavina	Barley	38.6	180.8	26.3	31.9	6.3	11.6	41.0	68.7	56.9	77.3
Haymaker	Barley	36.5	181.5	78.8	32.8	8.7	11.0	41.8	68.8	56.3	77.5
MT Cowgirl	Barley	38.4	180.0	66.3	31.4	6.4	11.2	41.4	68.9	56.7	78.0
MT Double Barrel	Barley	36.9	184.8	55.0	32.1	7.8	11.9	39.6	65.7*	58.1	82.2*
MT20_F099_05	Barley	38.1	180.0	83.8	33.7	5.9	10.8	41.4	67.7	56.7	76.9
MT20_F108_13	Barley	37.8	188.0	62.5	30.9	7.2	11.9*	40.9	68.0	57.1	77.5
MT20_F109_08	Barley	38.1	180.5	81.3	31.4	8.0	10.9	42.0	70.2	56.2	74.0
MT20_F109_22	Barley	37.4	180.5	80.0	36.8*	7.9	11.4	39.8	66.1	57.9	79.8
SD Titan	Oat	52.4	180.0*	0.0*	25.3	8.8	7.2	43.6	69.9	54.9	73.8
SD Momentum	Oat	58.4*	182.8	0.0*	24.0	8.0	5.8	49.4	75.4	50.4	62.4
Goliath	Oat	53.8	182.0	0.0*	25.1	8.7	8.7	42.9	69.9	55.5	74.6
Tyndal	Triticale	48.9	180.5	0.0*	29.2	7.3	10.4	39.2*	67.3	58.4*	81.5
Mean		42.9	181.8	44.5	30.4	7.6	10.2	41.9	68.9	56.2	76.3
CV%		4.6	0.5	42.4	7.2	18.5	8.0	3.9	3.4	2.2	5.4
LSD (0.05) ¹		2.8	1.3	27.1	3.2	NS	1.2	2.3	3.4	1.8	6.0
P-value		<0.01	<0.01	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01

PLT HT: Plant Height; HD: Heading; LOD: Lodging; MC: Moisture Content; YLD: Yield; PRO: Protein; ADF: Acid Detergent Fiber; NDF: Neutral Detergent Fiber; DDM: Digestible Dry Matter; RFV: Relative Feed Value

Bold* = top performer within a column; **Bold** = equivalent to top performer within a column

¹Fisher's protected LSD not significant when P-Value > 0.05

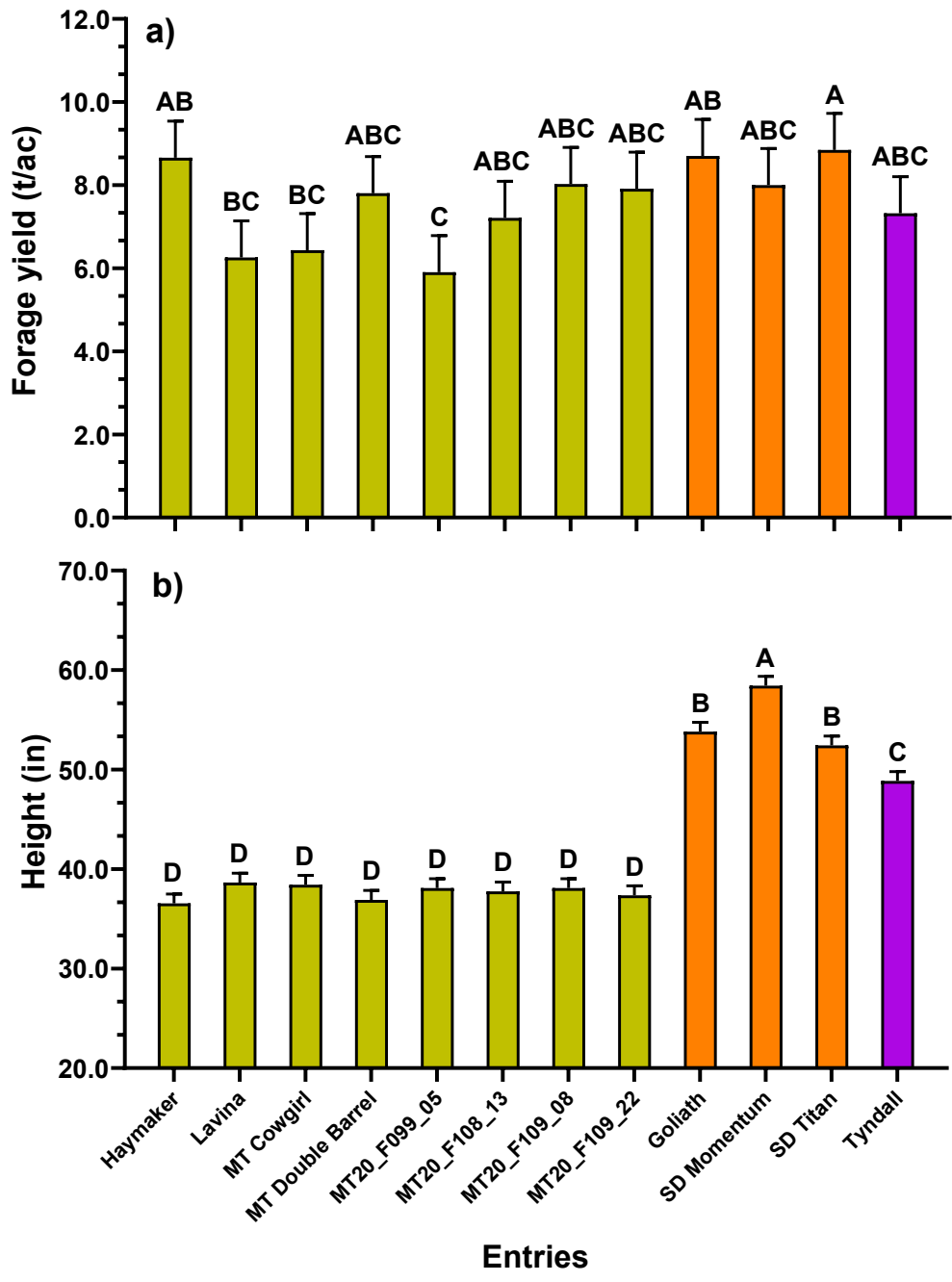


Figure 1 A & B. Forage yield and plant height by entry with barley, oat, and triticale color-coated from left to right respectively. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$.

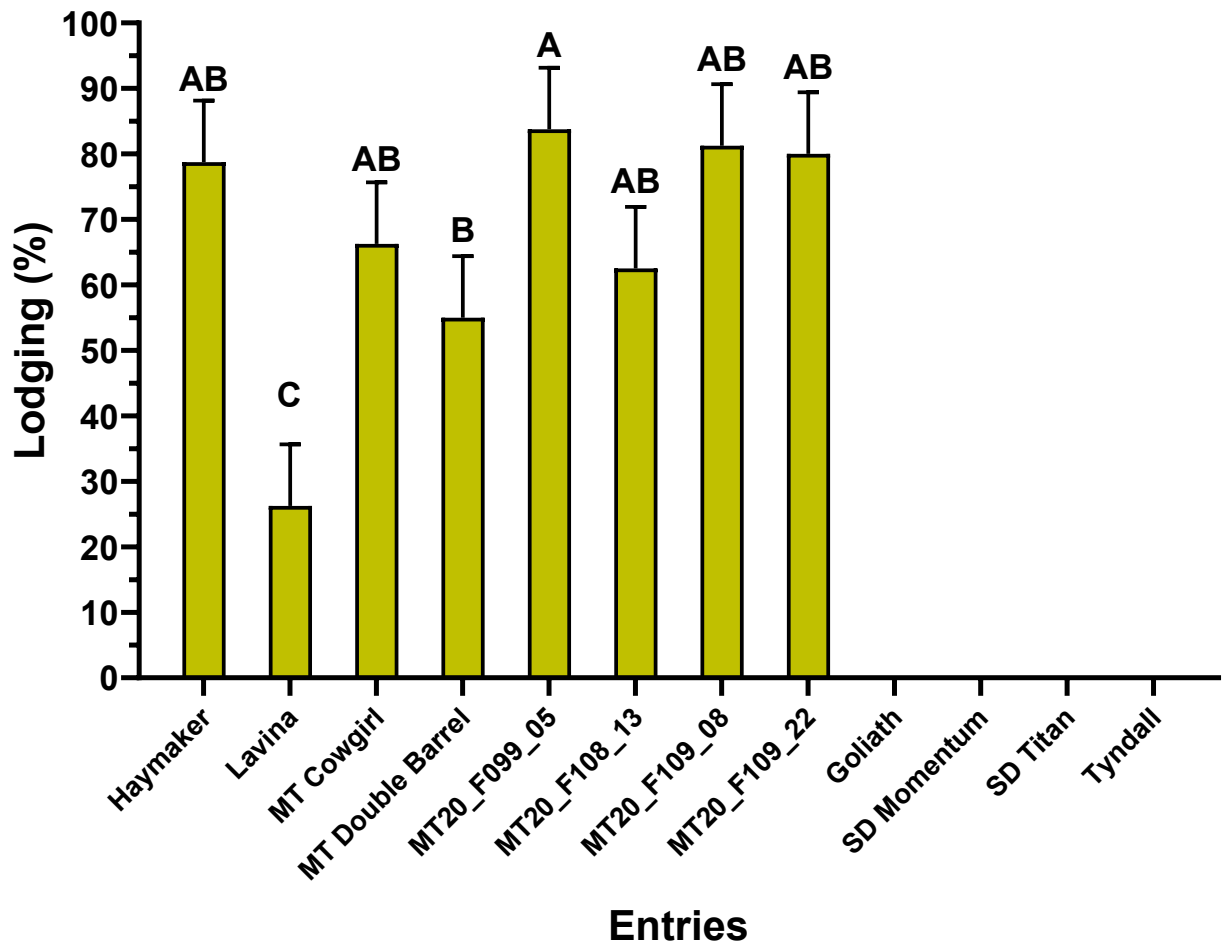


Figure 2. Plant lodging by entry with barley. The same letter assignment denotes an insignificant difference at $\alpha = 0.05$.

Acknowledgements:

We thank farm operations staff J. Penney and A. Goodman, without whom this research could not be successful. We also acknowledge J. Cain, A. Mathison, and E. Schreifels for their assistance with field operations, data collection, and sample processing.

OIL CROPS

Winter Canola and Spring Canola

Project Title:

Winter Canola Variety Trial

Objective:

To provide growers in Northwestern Montana with reliable, unbiased, and up-to-date data on how current and future winter canola varieties perform in this region. The data should help producers in the region select the varieties that are best for their area.

Personnel: D. Larson, R. Whitehead, J. Zimmerly, Z. Sippel, E. McGarvey, R. Arakaki, M. Stamm, J. Jensen

Summary:

25 entries of winter canola, in three repetitions, were planted on 18 August, 2024 and harvested on 3 September, 2025. The trial was rainfed, receiving 11.9 inches of rain during that period. Cultural practices can be found in table 1.

Mean yield was 18.1 Bu/A with DK EXSTAR having the highest (28 Bu/A) and CP1022WC the lowest (8 Bu/A). Mean test weight was 46 Lbs./Bu with TFW115D having the highest (50 Lbs./Bu) and CP1022WC having the lowest (15 Lbs./Bu). Mean oil was 27% with Janosh having the highest (44%) and KSR4854S the lowest (14%). Mean winter survival was 75% with CP1077WC having the highest (100%) and Surefire having the lowest (54%). Mean shatter was 7% with Surefire having the highest (19%) and DK EXSUN, DK SEAX, DK EXSTAR, TFW115D, and CP320WRR, the lowest (0%). Mean bloom date was day 132; 12 May, with TFW115D having the earliest (day 128; 8 May) and CP1022WC having the latest (day 136; 16 May).

We observed inconsistent winter kill this season; however, we observed sporadic pink snow mold across this study, which may have led to these results. Heat stress resulted in the loss of a large percentage of flowers. This, in turn, gave us very low and inconsistent yields. Overall, I would consider this field study a failure, with the only usable data for farmer selections being flowering data. All other data's CVs are too high to be used for meaningful decision-making.

Table 1. Management Information

Seeding date:	18 Sep. 2024 (262)	Field Location:	R7
		Harvest date:	3 Sept. 2025 (246)
Seeding rate:	N/A		
Previous crop:	Barley	Soil type:	Creston Silt Loam
Herbicide:	Gatlin + Woodside	Tillage:	Conventional
Insecticide:	N/A	Soil residual nutrient	
		(N, P, K Lbs./A):	55.5-18-110
Fungicide:	N/A	Nutrient fertilizer applied	
		(N, P, K Lbs./A):	140-0-0

Table 2. Agronomic Performance

NAME	WINSUR (%)	FLWR (Days)	PM (Days)	SHTTR (%)	TWT (Lbs./Bu)	OIL (%)	YLD (Bu/A)
CP1022WC	78.7	136	204	11.7	15.3	0.0	8.4
CP1066WC	79.6	134	200	12.7	47.6	13.9	11.3
CP1077WC	<u>99.5</u>	129	199	1.7	47.5	43.6	23.7
CP225WRR	60.1	134	199	16.7	31.7	27.5	14.9
CP320WRR	54.3	134	202	0.0	48.3	0.0	12.3
CP380WRR	59.4	134	203	12.0	47.8	14.0	12.6
DK EXCEPTION	65.2	133	202	0.3	46.0	27.9	19.6
DK EXIMA	88.4	129	200	3.0	48.3	40.7	21.7
DK EXSTAR	83.2	130	198	0.0	47.9	43.1	<u>28.2</u>
DK EXSUN	91.1	131	206	0.0	48.7	41.6	20.0
DK SEAX	89.9	132	201	0.0	49.2	40.6	19.2
DK SEPHOR	69.6	131	204	3.3	47.7	28.1	19.5
DK SEQUEL	75.6	130	199	1.7	48.9	42.3	19.0
DK SEVERNYI	74.2	133	201	10.0	48.6	28.4	20.0
Drifter	89.3	130	199	6.7	48.2	14.9	16.5
Janosh	83.0	130	202	3.3	48.8	<u>43.9</u>	21.6
KS4662	70.0	133	200	15.0	48.1	28.0	16.0
KS4737	62.2	131	200	8.7	47.2	14.5	21.6
KSR4854S	57.1	134	201	8.3	46.7	13.8	12.7
Manhattan	83.0	133	201	6.7	46.2	14.1	15.5
Star 930W	80.6	133	201	9.0	47.6	28.0	12.9
Surefire	54.1	131	198	<u>19.0</u>	48.2	28.4	22.0
TFW115D	77.1	<u>128</u>	<u>197</u>	0.0	<u>49.5</u>	43.2	25.3
Torrington	72.2	133	201	11.3	46.0	13.9	11.9
Triathlon	88.4	133	198	3.3	48.4	43.1	25.2
Mean	75.4	132.0	200.6	6.6	45.9	27.1	18.1
CV (%)	28.0	1.1	1.4	120.5	16.6	65.7	40.8
P-value	0.3	<0.001	0.05	0.08	<0.001	0.03	0.14
MSD	66.9	4.5	8.9	25.1	24.2	56.4	23.3

Bold= Highest value or earliest date in column, **Bold**= Statistically equal to highest or earliest value in column, WINSUR= Winter Survival (%), FLWR= Flower Date (days),SHTTR= Shatter (%), Pro= Protein (%), TWT= test weight (Lbs./Bu), OIL= Oil content (%), YLD= Yield (Bu/A)

Project Title:

Montana Statewide Spring Canola Variety Trial

Objective:

To evaluate the agronomic performance of available canola hybrids and breeding lines submitted by commercial entities at testing locations across the state. The information obtained from these trials is intended to provide canola growers in Montana with unbiased information regarding which canola hybrids are best suited to their specific growing conditions

Personnel:

Marilyn Dalen, Emily McGarvey, Jessica Torrion, Patrick Carr and Simon Fordyce

Summary:

Performance of 16 spring canola entries was evaluated at the Northwestern Agricultural Research Center. The trials used a randomized complete block design with four replications. Plots were managed according to best practices for each location (see Table 1. Management Information). Agronomic data were collected throughout the growing season.

CS3300TF was the top performer in yield at 3,648 lbs/ac followed closely by LR354PC (3,562 lbs/A) and DK401TL (3,496 lbs/A), all of which were above the average (Table 2) but statistical differences were not detected.

CS26000 CR-T had the highest oil content at 51% and the rest had oil content lower than 51% (Table 2). Test weight ranged from 49.2 lbs/bu (L340PC) to 50.8 lbs/bu (RUBCL0225) with an average of 49.7 lb/bu. The resulting plant count per square foot was similar across entries (and are not significantly different from each other) with an average plant count of 16.2/ ft² following the target uniform seed density of the nursery. Plant height ranged from 52.2 in. (CP9221TF) to 57 in. (DL231945TF). The CS2600CR-T had the highest lodging score at 42%. However, the overall lodging of the nursery was minimal – with an average of 5.5% (Table 2). Though CS3000TF and CS2600CR-T had the highest average percentage of shattering at 9%, all entries are not significantly different in terms of pod shattering.

Table 1. Management Information

Seeding date:	5/2/2025 (122 Julian)	Field Location:	Y8
Seeding rate:	Standard	Harvest date:	9/2/2025 (245 Julian)
Previous crop:	Barley	Soil type:	Swims Silty Clay Loam
		Tillage:	Conventional
Herbicide:	Pre-Plant: Triflurex HFP	Soil residual nutrient (N, P, K, S lb/A):	93.5-22-250-84 (Fall 2024)
Insecticide:	Lambda-CY	Nutrient fertilizer applied (N, P, K, S lb/A):	115-35-40-0 (Spring 2025)
Fungicide:	N/A		

Table 2. Agronomic Performance

Entries	FLWR (Julian)	Plant Count (ft ²)	Canopy Height (in)	LOD (%)	Pod Shatter (%)	Yield ¹ (lbs/A)	TWT (lbs/bu)	Oil Content (%)
CS2600CR-T	168*	16.5	53.7	42*	9	3318	50.4	51.0*
CS3000TF	168*	14.5	54.0	18	9	3141	50.4	50.4
CS3300TF	168*	15.9	57.2	0.0	0	3648	50.4	50.8
CS4000LL	169	15.1	58.0	2.0	3	3203	50.0	50.6
DG661LCM	169	15.6	59.2	0.0	0	3208	50.1	50.4
DG783TCN	168*	14.8	54.0	0.0	0	3382	50.4	50.4
DK401TL	168*	16.5	57.6	0.0	0	3496	50.4	50.3
L333PC	171	15.9	57.9	1.0	0	3163	50.1	48.8
L340PC	169	20.1	56.0	0.0	0	3178	49.2	48.8
L345PC	171	14.2	58.3	5.0	0	3375	50.5	48.9

Table 2. Agronomic Performance (continued)

LR344PC	171	16.5	59.0	0.0	0	3276	50.2	49.1
LR354PC	174	15.5	63.4*	0.0	0	3562	50.6	49.8
NCC101S	168*	18.8	52.5	12	8	3145	50.2	47.0
NCC2504B	168*	14.6	52.2	2.0	5	2868	50.2	49.6
RUBCL0225	171	16.8	54.6	4.0	0	3116	50.8*	49.9
RUBCL0924	168*	17.9	53.6	1.0	0	3191	50.2	49.1
Mean	169	16.2	56.3	5.5	0.5	3267	50.3	49.7
CV%	0.210	21.2	3.16	230	300	8.733	0.352	1.24
LSD	0.506	NS	2.53	18	NS	NS	0.252	0.880
P-Value	<0.001	0.596	<0.001	0.002	0.360	0.061	<0.001	<0.001

FLWR: flowering date; LOD: lodging; TWT: test weight ; NS: Not significant

Bold* = top performer within a column; **Bold** = equivalent to top performer within a column;

¹Seed Yield was adjusted to 8.5% moisture

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