

Project Title: Evaluation of malt barley under flood irrigated and sprinkler irrigated conditions, 2014 (4W4640)

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Objective: To evaluate lines and varieties of malt barley varieties under sprinkler and flood irrigation.

Methods:

	Plot numbers	Planted:	Harvested:
Exp#1 flood	14001-14111	May 2	Aug 11
Exp #1 sprinkler	14112-14222	May 5	Aug 21

Soil type: Savage silty clay

Flood:

Previous crops: 2013 –sugarbeet, 2012 – safflower, 2011 – spring wheat

Residual soil N to 4 ft: 39 lb N/ac

Residual soil P to 6 in: 15 ppm

Applied fertilizer: 400 lb 18:46:0

No irrigations

Herbicides: Full Deck 16 oz/ac and Axial 16 oz/ac, applied June 6

Sprinkler:

Previous crops: 2013 – safflower, 2012– sugarbeet, 2011 – small grain

Residual soil N to 4 ft: 93 lb N/ac

Residual soil P to 6 in: 20 ppm

Applied fertilizer: 400 18-46-0 lb N/ac

Irrigated (sprinkler) on June 27, 1.6 inch

Herbicides: Full Deck 16 oz/ac and Axial 16 oz/ac, applied Jun 10

Precipitation April – August, 2014: 11.92 in

Ave (65 yr) precipitation April – August: 9.67 in

Precipitation September 2013 – August 2014: 14.97 in

Ave (65 yr) precipitation September – August: 14.11 in

Conditions were wet at planting. May and August had much above average rainfall.

Results:

Agronomic data from the flood irrigated trial are shown in Table 1. Five-year summaries for yield, test weight, percent plump seed, grain protein percent and lodging indices are shown in Tables 2-6. Agronomic data from the sprinkler irrigated trial are shown in Table 7. Five-year summaries for yield, test weight, percent plump seed, grain protein percent and lodging indices are shown in Tables 8-12. CDC Copeland yielded most under flood irrigation (Table 1).

Average yield was 114.8 bu/ac. Stout yielded most under sprinkler irrigation Table 6). Average yield was 140.3 bu/ac.

SUMMARY: Malt barley trials are conducted under flood and sprinkler irrigation. All experiments reported under this project are of the replicated small plot type. These trials provide important information about performance of malt barley lines and varieties.

FUNDING SUMMARY: Expenditure information to be provided by OSP. No other grants support this project.

MWBC FY2015 GRANT SUBMISSION PLANS: It is planned to submit this project for funding consideration in the next fiscal year.

Table 1. Agronomic data obtained from NDSU exp#1 conducted under flood irrigated conditions at the Eastern Agricultural Research Center, Sidney, MT.

entry	heading*	height, cm	grain protein, %	test wt, lb/bu	percent plump	percent regular	yield, bu/ac	
CDC Copeland	55.0	90.3	10.50	51.0	97.6	2.2	137.0	a
Stout	49.3	79.0	10.63	49.5	97.8	1.9	129.8	
2B05-0811	54.0	75.3	10.31	49.5	96.2	3.3	127.0	
Hockett	52.0	85.7	10.59	52.5	98.2	1.3	126.4	
ND28554	50.0	93.0	11.06	49.0	98.6	1.0	125.5	
2ND28065	51.7	81.0	10.63	52.0	96.6	3.2	125.5	
2ND27705	53.3	86.0	9.84	50.5	98.1	1.5	124.4	
2ND30639	51.3	81.7	11.86	52.5	98.9	0.9	121.3	
ND28555	50.0	88.7	10.97	49.5	98.5	1.2	120.5	
Tradition	51.0	88.3	11.21	49.5	98.1	1.2	119.7	
2ND30749	51.3	88.7	11.11	51.0	99.1	0.7	119.3	
2ND30879	50.3	83.7	10.00	49.5	98.3	1.4	118.8	
ND30377	50.0	89.3	11.04	49.0	95.4	4.0	118.3	
Quest	51.3	95.0	12.18	50.0	94.6	5.1	118.1	
Pinnacle	52.3	88.3	10.47	51.0	99.1	0.8	117.3	
M152	49.0	91.3	11.91	50.5	96.7	3.0	116.6	
Lacey	50.7	85.0	12.71	51.0	93.0	6.2	116.4	
Rawson	50.3	90.3	11.18	49.0	99.3	0.7	116.4	
CDC Meredith	55.0	84.3	9.99	50.0	98.2	1.5	114.9	
ND30320	50.0	90.0	10.14	49.0	97.8	2.2	113.9	
AC Metcalfe	51.7	83.7	11.49	52.0	97.3	2.4	113.5	
ND26891	51.0	84.3	10.46	50.5	98.3	1.6	112.5	
Conrad	55.0	78.0	11.26	52.0	98.6	1.1	112.3	
Conlon	48.0	78.3	11.52	51.5	99.3	0.6	112.0	
ND29380	52.0	83.0	11.31	49.0	96.4	3.2	111.7	
2ND30837	52.7	85.0	12.44	51.5	98.5	1.2	111.6	
Innovation	50.7	91.3	11.76	51.0	98.9	0.9	111.5	
Celebration	51.3	89.3	12.18	49.0	92.7	6.9	111.0	
ND29196	54.0	82.0	10.77	49.0	96.9	2.6	110.9	
ND27177	50.3	86.7	10.32	49.0	96.8	3.0	108.7	
STELLAR-ND	50.3	88.3	11.84	49.0	95.2	4.1	107.8	
2ND25276	51.7	87.7	10.42	51.0	98.9	1.0	106.8	
ND30159	52.0	86.0	11.38	50.0	98.8	1.0	102.0	x
2ND30672	49.7	83.7	11.70	50.0	99.1	0.9	99.6	x
ROBUST	51.0	100.0	13.33	50.5	93.0	6.5	98.9	x
2ND30724	52.3	84.0	11.87	51.0	99.0	0.7	98.8	x
ND30304	51.7	83.3	11.31	49.0	97.9	1.8	91.3	x
average	51.4	86.2	11.18	50.3	97.5	2.2	114.8	
probability	<0.001	<0.001					<0.001	
CV (S/mean)	1.3	5.7					9.2	
LSD (0.05)	1.1	7.9					17.1	

*days from planting

a indicates significantly greater yield than check variety, Tradition, at $p = 0.05$

x indicates significantly lower yield than check variety, Tradition, at $p = 0.05$

Table 2. Relative yields of barley varieties in bu/ac as compared to Tradition when grown under flood irrigated conditions at the EARC, Sidney, Montana. No irrigation in 2012.

variety	2009	2010	2011	2012	2014	average	as % of Tradition
ND28065	--	--	--	73.2	125.5	99.4	110.9
ND28554	--	--	--	66.1	125.5	95.8	106.9
2B05-0811	--	--	--	--	127.0	127.0	106.1
Hockett	--	--	--	--	126.4	126.4	105.6
ND28555	--	--	--	67.7	120.5	94.1	105.0
Stout (ND22421)	156.3	83.6	61.0	65.1	129.8	99.2	103.6
2ND25276	141.8	98.2	85.2	58.7	106.8	98.1	102.5
Lacey	138.3	91.4	77.9	65.0	116.4	97.8	102.2
Pinnacle	158.3	102.7	57.2	53.4	117.3	97.8	102.2
Innovation	145.3	85.4	79.6	64.7	111.5	97.3	101.7
2ND30639	--	--	--	--	121.3	121.3	101.3
Quest	139.4	95.6	67.4	61.7	118.1	96.4	100.8
ND27177	--	--	76.7	71.3	108.7	85.6	100.5
2ND27705	--	--	--	55.3	124.4	89.9	100.3
Tradition	138.3	84.8	76.2	59.5	119.7	95.7	100.0
2ND30749	--	--	--	--	119.3	119.3	99.7
2ND30879	--	--	--	--	118.8	118.8	99.2
ND30377	--	--	--	--	118.3	118.3	98.8
CDC Copeland	122.6	94.0	58.4	58.2	137.0	94.0	98.3
Rawson	131.3	79.4	71.6	71.2	116.4	94.0	98.2
ND26891	--	--	70.8	65.7	112.5	83.0	97.5
M152	--	--	--	--	116.6	116.6	97.4
CDC Meredith	--	--	--	--	114.9	114.9	96.0
Celebration	128.8	90.3	58.9	69.1	111.0	91.6	95.7
ND30320	--	--	--	--	113.9	113.9	95.2
AC Metcalfe	137.8	96.1	57.4	50.4	113.5	91.0	95.1
Stellar-ND	129.5	89.5	62.9	63.7	107.8	90.7	94.8
Conlon	125.0	87.4	60.8	61.7	112.0	89.4	93.4
ND29380	--	--	--	--	111.7	111.7	93.3
2ND30837	--	--	--	--	111.6	111.6	93.2
ND29196	--	--	--	--	110.9	110.9	92.6
Robust	114.8	92.2	71.8	59.7	98.9	87.5	91.4
Conrad	--	--	54.6	53.1	112.3	73.3	86.1
ND30159	--	--	--	--	102.0	102.0	85.2
2ND30672	--	--	--	--	99.6	99.6	83.2
2ND30724	--	--	--	--	98.8	98.8	82.5
ND30304	--	--	--	--	91.3	91.3	76.3

NOTE: Average yields in this summary should not be compared to each other since they are not grown in the same years. Compare yields only to the check variety.

Table 3. Relative test weights of barley varieties in lb/bu as compared to Tradition when grown under flood irrigated conditions at the EARC, Sidney, Montana. No irrigation in 2012.

variety	2009	2010	2011	2012	2014	average	as % of Tradition
ND28065	--	--	--	49.0	52.0	50.5	106.9
Hockett	--	--	--	--	52.5	52.5	106.1
2ND30639	--	--	--	--	52.5	52.5	106.1
2ND30837	--	--	--	--	51.5	51.5	104.0
Conlon	51.2	50.2	42.0	49.0	51.5	48.8	104.0
2ND30749	--	--	--	--	51.0	51.0	103.0
2ND30724	--	--	--	--	51.0	51.0	103.0
2ND25276	50.2	48.3	45.0	45.0	51.0	47.9	102.1
M152	--	--	--	--	50.5	50.5	102.0
AC Metcalfe	51.0	49.0	41.0	45.0	52.0	47.6	101.5
Lacey	48.5	49.0	44.0	45.0	51.0	47.5	101.3
CDC Meredith	--	--	--	--	50.0	50.0	101.0
ND30159	--	--	--	--	50.0	50.0	101.0
2ND30672	--	--	--	--	50.0	50.0	101.0
Rawson	49.0	48.3	43.0	47.5	49.0	47.4	101.0
Innovation	48.8	47.2	43.0	46.5	51.0	47.3	100.9
Pinnacle	49.3	48.5	43.0	44.5	51.0	47.3	100.8
2ND27705	--	--	--	44.5	50.5	47.5	100.5
Robust	48.3	46.8	45.0	44.5	50.5	47.0	100.3
Tradition	48.7	47.3	44.0	45.0	49.5	46.9	100.0
2B05-0811	--	--	--	--	49.5	49.5	100.0
2ND30879	--	--	--	--	49.5	49.5	100.0
ND26891	--	--	43.5	44.0	50.5	46.0	99.6
ND28555	--	--	--	44.5	49.5	47.0	99.5
CDC Copeland	49.7	47.3	41.0	44.0	51.0	46.6	99.4
Conrad	--	--	40.0	45.5	52.0	45.8	99.3
ND27177	--	--	43.0	45.5	49.0	45.8	99.3
ND30377	--	--	--	--	49.0	49.0	99.0
ND30320	--	--	--	--	49.0	49.0	99.0
ND29380	--	--	--	--	49.0	49.0	99.0
ND29196	--	--	--	--	49.0	49.0	99.0
ND30304	--	--	--	--	49.0	49.0	99.0
Quest	46.8	46.2	42.0	46.5	50.0	46.3	98.7
ND28554	--	--	--	44.0	49.0	46.5	98.4
Stout (ND22421)	47.7	47.2	39.5	44.5	49.5	45.7	97.4
Stellar-ND	47.2	47.0	39.5	45.5	49.0	45.6	97.3
Celebration	47.3	47.0	40.5	44.0	49.0	45.6	97.1

NOTE: Average test weights in this summary should not be compared to each other since they are not grown in the same years. Compare test weights only to the check variety.

Table 4. Relative percent plump of barley varieties as compared to Tradition when grown under flood irrigated conditions at the EARC, Sidney, Montana.

	2009	2010	2011	2012	2014	average	as % of Tradition
Rawson	96	98	79	91	99	92.6	114.0
ND28065	--	--	--	80	97	88.5	113.5
Conlon	97	98	78	87	99	91.8	113.1
2ND25276	97	97	82	78	99	90.6	111.6
ND27177	--	--	81	62	97	80.0	108.1
ND28555	--	--	--	70	98	84.0	107.7
Pinnacle	95	96	76	70	99	87.2	107.4
Innovation	95	93	67	75	99	85.8	105.7
ND28554	--	--	--	64	99	81.5	104.5
ND26891	--	--	76	55	98	76.3	103.2
Stout(ND22421)	91	93	59	73	98	82.8	102.0
2ND30639	--	--	--	--	99	99.0	101.0
2ND30749	--	--	--	--	99	99.0	101.0
ND30159	--	--	--	--	99	99.0	101.0
2ND30672	--	--	--	--	99	99.0	101.0
2ND30724	--	--	--	--	99	99.0	101.0
2ND27705	--	--	--	59	98	78.5	100.6
Tradition	92	92	66	58	98	81.2	100.0
Hockett	--	--	--	--	98	98.0	100.0
2ND30879	--	--	--	--	98	98.0	100.0
CDC Meredith	--	--	--	--	98	98.0	100.0
ND30320	--	--	--	--	98	98.0	100.0
2ND30837	--	--	--	--	98	98.0	100.0
ND30304	--	--	--	--	98	98.0	100.0
M152	--	--	--	--	97	97.0	99.0
ND29196	--	--	--	--	97	97.0	99.0
Celebration	91	91	67	57	93	79.8	98.3
2B05-0811	--	--	--	--	96	96.0	98.0
ND29380	--	--	--	--	96	96.0	98.0
Quest	88	88	59	66	95	79.2	97.5
Stellar-ND	94	93	52	61	95	79.0	97.3
ND30377	--	--	--	--	95	95.0	96.9
Lacey	91	91	59	57	93	78.2	96.3
Conrad	--	--	41	72	99	70.7	95.5
Robust	82	89	69	51	93	76.8	94.6
CDC Copeland	88	93	44	58	98	76.2	93.8
AC Metcalfe	90	92	52	48	97	75.8	93.3

NOTE: Average percent plump in this summary should not be compared to each other since they are not grown in the same years. Compare percent plump only to the check variety.

Table 5. Relative protein contents of barley varieties in percent as compared to Tradition when grown under flood irrigated conditions at the EARC, Sidney, Montana.

	2009	2010	2011	2012	2014	average	as % of Tradition
2ND30837	--	--	--	--	12.4	12.4	110.7
Conrad	--	--	13.8	16.1	11.3	13.7	106.7
2ND30639	--	--	--	--	11.9	11.9	106.3
M152	--	--	--	--	11.9	11.9	106.3
2ND30724	--	--	--	--	11.9	11.9	106.3
AC Metcalfe	11.4	10.8	13.7	16.0	11.5	12.7	106.0
2ND30672	--	--	--	--	11.7	11.7	104.5
Robust	12.0	10.0	11.1	15.1	13.3	12.3	102.8
ND30159	--	--	--	--	11.4	11.4	101.8
ND28554	--	--	--	15.1	11.1	13.1	101.6
Celebration	11.7	10.3	10.4	15.8	12.2	12.1	101.0
ND29380	--	--	--	--	11.3	11.3	100.9
ND30304	--	--	--	--	11.3	11.3	100.9
Lacey	10.5	9.6	12.3	14.7	12.7	12.0	100.0
Tradition	11.5	9.7	12.8	14.6	11.2	12.0	100.0
Quest	11.4	9.6	11.6	14.6	12.2	11.9	99.3
2ND30749	--	--	--	--	11.1	11.1	99.1
ND28555	--	--	--	14.5	11.0	12.8	98.8
ND30377	--	--	--	--	11.0	11.0	98.2
CDC Copeland	10.3	9.4	13.1	15.0	10.5	11.7	97.5
Conlon	11.4	10.9	10.9	13.1	11.5	11.6	96.7
ND29196	--	--	--	--	10.8	10.8	96.4
Rawson	11.8	10.5	11.8	12.2	11.2	11.5	96.2
Hockett	--	--	--	--	10.6	10.6	94.6
2ND25276	10.2	10.0	11.4	14.4	10.4	11.3	94.3
Innovation	11.0	9.3	10.1	13.8	11.8	11.2	93.6
ND27177	--	--	12.2	13.6	10.3	12.0	93.5
2ND27705	--	--	--	14.3	9.8	12.1	93.4
Stellar-ND	10.9	9.3	10.2	13.4	11.8	11.1	93.0
Stout (ND22421)	11.4	9.8	9.9	13.4	10.6	11.0	92.1
ND26891	--	--	11.3	13.7	10.5	11.8	92.0
2B05-0811	--	--	--	--	10.3	10.3	92.0
ND28065	--	--	--	13.0	10.6	11.8	91.5
Pinnacle	10.3	10.1	11.0	12.8	10.5	10.9	91.5
ND30320	--	--	--	--	10.1	10.1	90.2
2ND30879	--	--	--	--	10.0	10.0	89.3
CDC Meredith	--	--	--	--	10.0	10.0	89.3

NOTE: Average protein contents in this summary should not be compared to each other since they are not grown in the same years. Compare protein contents only to the check variety.

Table 6. Relative lodging indices of barley varieties in percent as compared to Tradition when grown under flood irrigated conditions at the EARC, Sidney, Montana.

	2009	2010	2011	2012	2014	average	as % of Tradition
Lacey	5.0	5.0	1.0	0.0	0.0	2.2	244.4
Stellar-ND	3.5	5.3	0.0	0.0	0.0	1.8	195.6
Robust	5.0	2.7	0.7	0.0	0.0	1.7	186.7
Conlon	6.0	0.7	0.0	0.0	0.0	1.3	148.9
Quest	2.0	4.0	0.0	0.0	0.0	1.2	133.3
Innovation	2.3	2.7	0.0	0.0	0.0	1.0	111.1
CDC Copeland	4.3	0.0	0.3	0.0	0.0	0.9	102.2
Tradition	2.2	2.3	0.0	0.0	0.0	0.9	100.0
Celebration	2.0	2.0	0.0	0.0	0.0	0.8	88.9
Stout (ND22421)	1.3	2.7	0.0	0.0	0.0	0.8	88.9
Rawson	3.0	0.0	0.0	0.0	0.0	0.6	66.7
2ND25276	2.3	0.0	0.0	0.0	0.0	0.5	51.1
AC Metcalfe	2.3	0.0	0.0	0.0	0.0	0.5	51.1
Pinnacle	1.0	0.0	0.0	0.0	0.0	0.2	22.2
Conrad	--	--	0.0	0.0	0.0	0.0	0.0
ND26891	--	--	0.0	0.0	0.0	0.0	0.0
ND27177	--	--	0.0	0.0	0.0	0.0	0.0
ND28065	--	--	--	0.0	0.0	0.0	0.0
ND28554	--	--	--	0.0	0.0	0.0	0.0
ND28555	--	--	--	0.0	0.0	0.0	0.0
2ND27705	--	--	--	0.0	0.0	0.0	0.0
2B05-0811	--	--	--	--	0.0	0.0	0.0
Hockett	--	--	--	--	0.0	0.0	0.0
2ND30639	--	--	--	--	0.0	0.0	0.0
2ND30749	--	--	--	--	0.0	0.0	0.0
2ND30879	--	--	--	--	0.0	0.0	0.0
ND30377	--	--	--	--	0.0	0.0	0.0
M152	--	--	--	--	0.0	0.0	0.0
CDC Meredith	--	--	--	--	0.0	0.0	0.0
ND30320	--	--	--	--	0.0	0.0	0.0
ND29380	--	--	--	--	0.0	0.0	0.0
2ND30837	--	--	--	--	0.0	0.0	0.0
ND29196	--	--	--	--	0.0	0.0	0.0
ND30159	--	--	--	--	0.0	0.0	0.0
2ND30672	--	--	--	--	0.0	0.0	0.0
2ND30724	--	--	--	--	0.0	0.0	0.0
ND30304	--	--	--	--	0.0	0.0	0.0

NOTE: Average lodging indices in this summary should not be compared to each other since they are not grown in the same years. Compare lodging indices only to the check variety.

Table 7. Agronomic data obtained from NDSU exp#1 conducted under sprinkler irrigated conditions at the Eastern Agricultural Research Center, Sidney, MT.

entry	heading*	height, cm	lodging index	grain protein, %	test wt, lb/bu	percent plump	percent regular	yield, bu/ac	
Stout	49.0	91.7	0.7	12.33	48.0	99.4	0.6	157.4	
2ND27705	52.0	99.0	4.0	11.08	48.5	97.4	2.3	156.6	
ND29380	51.3	93.3	0.0	11.22	48.5	99.0	0.7	156.2	
Stellar-ND	49.0	102.7	2.3	12.66	48.5	99.4	0.6	155.3	
Lacey	50.3	101.0	5.0	12.02	50.5	98.4	1.5	155.1	
ND27177	49.0	101.3	3.0	12.15	48.0	98.8	0.9	154.3	
ND26891	50.3	96.3	0.7	11.87	49.0	98.6	1.3	153.9	
Tradition	50.7	104.0	2.7	12.22	49.0	97.6	1.9	152.1	
ND30159	51.0	97.7	0.7	10.52	50.0	99.4	0.6	149.9	
ND30377	49.7	109.7	1.3	11.58	49.0	97.6	2.2	148.4	
ND28554	49.7	103.0	0.3	12.78	49.0	99.1	0.7	145.5	
ND29196	52.0	106.0	0.3	11.66	48.0	98.2	1.5	145.0	
ND30304	51.3	96.0	0.3	12.12	47.5	98.5	1.2	145.0	
ND30320	50.3	101.0	3.7	11.67	49.0	97.6	2.2	144.8	
2ND30749	48.0	92.3	0.7	11.27	50.5	98.6	1.1	144.0	
CDC Copeland	55.0	105.0	2.7	11.19	49.0	98.0	1.6	143.1	
ND28555	50.7	105.0	0.7	13.57	49.0	98.5	0.8	142.7	
Celebration	51.0	99.3	4.7	13.84	49.5	98.5	1.4	142.1	
Innovation	50.0	103.7	3.0	13.12	48.5	98.7	1.2	142.1	
M152	49.0	104.0	6.0	13.13	48.5	97.5	2.0	141.6	
Conlon	46.3	96.3	6.3	12.50	51.0	98.5	1.3	140.4	
2B05-0811	53.7	88.3	4.3	11.45	47.5	93.4	5.7	138.6	
AC Metcalfe	51.3	102.0	3.3	11.93	49.5	98.1	1.6	138.4	
Conrad	54.3	93.3	1.3	12.20	50.5	97.3	2.2	137.8	
2ND25276	51.0	103.0	1.0	10.47	49.5	98.3	1.5	136.9	
Robust	50.7	106.7	3.3	12.56	50.5	97.6	2.2	135.6	x
2ND30672	47.7	90.3	1.3	11.91	48.0	98.0	1.6	134.1	x
CDC Meredith	55.0	89.0	6.3	12.25	47.5	95.3	4.1	133.0	x
2ND28065	51.7	96.3	4.7	11.97	50.5	93.1	5.7	132.5	x
Pinnacle	51.7	99.3	0.3	10.48	50.5	98.7	1.1	129.3	x
Quest	50.7	101.0	5.3	12.74	49.0	96.2	3.5	127.8	x
2ND30724	52.0	93.7	1.7	12.24	50.0	96.5	3.0	126.7	x
2ND30837	51.3	89.3	3.0	12.04	49.5	98.4	1.4	124.8	x
2ND30639	52.3	91.3	5.7	14.60	51.5	97.9	1.8	123.5	x
Rawson	50.7	97.3	7.0	12.88	49.0	97.7	2.0	122.0	x
2ND30879	49.0	98.0	3.7	10.84	47.5	97.9	1.8	120.7	x
Hockett	51.7	82.3	8.7	12.75	50.5	92.1	6.2	114.8	x
average	50.8	98.1	3.0	12.10	49.2	97.7	2.0	140.3	
probability	<0.001	<0.001	<0.001					<0.001	
CV (S/mean)	1.8	4.3	46.6					6.9	
LSD (0.05)	1.5	6.8	2.3					15.7	

*days from planting

x indicates significantly lower yield than check variety, Tradition, at p = 0.05

Table 8. Relative yields of barley varieties in bu/ac as compared to Tradition when grown under sprinkler irrigated conditions at the EARC, Sidney, Montana. Disease in 2011. Hailed out 2013.

Cultivar	2009	2010	2011	2012	2014	average	as % of Tradition
2ND25276	144.1	123.4	85.8	85.9	136.9	115.2	106.9
ND26891	--	--	51.2	109.2	153.9	104.8	103.8
Innovation	122.1	124.3	62.4	108.3	142.1	111.8	103.7
ND29380	--	--	--	--	156.2	156.2	102.7
2ND27705	--	--	--	92.0	156.6	124.3	102.6
Lacey	107.4	124.6	58.8	105.0	155.1	110.2	102.2
ND27177	--	--	48.2	106.2	154.3	102.9	101.9
ND28554	--	--	--	101.5	145.5	123.5	101.9
Stout (ND22421)	123.4	118.6	46.6	102.7	157.4	109.7	101.8
Tradition	121.9	114.2	60.5	90.3	152.1	107.8	100.0
ND28555	--	--	--	99.2	142.7	121.0	99.8
ND30159	--	--	--	--	149.9	149.9	98.6
ND30377	--	--	--	--	148.4	148.4	97.6
Rawson	114.3	114.0	66.4	104.3	122.0	104.2	96.7
Quest	125.1	120.3	53.6	93.3	127.8	104.0	96.5
Conlon	124.2	113.3	50.4	87.3	140.4	103.1	95.7
2ND28065	--	--	--	98.9	132.5	115.7	95.5
ND29196	--	--	--	--	145.0	145.0	95.3
ND30304	--	--	--	--	145.0	145.0	95.3
ND30320	--	--	--	--	144.8	144.8	95.2
CDC Copeland	122.8	122.5	48.5	76.2	143.1	102.6	95.2
2ND30749	--	--	--	--	144.0	144.0	94.7
Stellar-ND	116.4	102.8	40.3	94.5	155.3	101.9	94.5
Pinnacle	137.5	109.0	38.0	93.1	129.3	101.4	94.0
Celebration	109.6	115.0	48.3	87.1	142.1	100.4	93.2
M152	--	--	--	--	141.6	141.6	93.1
Robust	95.7	113.0	53.1	94.6	135.6	98.4	91.3
Conrad	--	--	44.8	93.5	137.8	92.0	91.2
2BO5-0811	--	--	--	--	138.6	138.6	91.1
2ND30672	--	--	--	--	134.1	134.1	88.2
CDC Meredith	--	--	--	--	133.0	133.0	87.4
AC Metcalfe	111.9	107.2	40.5	72.7	138.4	94.1	87.3
2ND30724	--	--	--	--	126.7	126.7	83.3
2ND30837	--	--	--	--	124.8	124.8	82.1
2ND30639	--	--	--	--	123.5	123.5	81.2
2ND30879	--	--	--	--	120.7	120.7	79.4
Hockett	--	--	--	--	114.8	114.8	75.5

NOTE: Average yields in this summary should not be compared to each other since they are not grown in the same years. Compare yields only to the check variety.

Table 9. Relative test weights of barley varieties in lb/bu as compared to Tradition when grown under sprinkler irrigated conditions at the EARC, Sidney, Montana. Disease in 2011. Hailed out in 2013.

Cultivar	2009	2010	2011	2012	2014	average	as % of Tradition
2ND30639	--	--	--	--	51.5	51.5	105.1
Conlon	51.0	49.2	45.5	49.5	51.0	49.2	104.5
2ND30749	--	--	--	--	50.5	50.5	103.1
Hockett	--	--	--	--	50.5	50.5	103.1
2ND28065	--	--	--	48.5	50.5	49.5	102.6
ND30159	--	--	--	--	50.0	50.0	102.0
2ND30724	--	--	--	--	50.0	50.0	102.0
Robust	47.8	47.8	44.5	49.0	50.5	47.9	101.7
Lacey	46.7	47.8	46.0	48.5	50.5	47.9	101.7
Conrad	--	--	45.0	47.5	50.5	47.7	101.4
AC Metcalfe	49.0	48.3	44.5	47.0	49.5	47.7	101.2
2ND25276	47.8	47.8	45.0	48.0	49.5	47.6	101.1
2ND30837	--	--	--	--	49.5	49.5	101.0
Rawson	47.7	47.7	45.0	47.5	49.0	47.4	100.6
ND28555	--	--	--	48.0	49.0	48.5	100.5
Pinnacle	48.3	46.8	43.0	48.0	50.5	47.3	100.5
Tradition	47.2	47.3	44.5	47.5	49.0	47.1	100.0
ND30377	--	--	--	--	49.0	49.0	100.0
ND30320	--	--	--	--	49.0	49.0	100.0
ND28554	--	--	--	47.0	49.0	48.0	99.5
CDC Copeland	47.2	48.2	43.0	46.5	49.0	46.8	99.3
Innovation	47.8	46.0	44.0	47.5	48.5	46.8	99.3
ND29380	--	--	--	--	48.5	48.5	99.0
M152	--	--	--	--	48.5	48.5	99.0
Quest	46.2	46.5	44.0	47.0	49.0	46.5	98.8
ND26891	--	--	43.5	46.5	49.0	46.3	98.6
ND29196	--	--	--	--	48.0	48.0	98.0
2ND30672	--	--	--	--	48.0	48.0	98.0
Stellar-ND	45.5	45.0	43.5	47.5	48.5	46.0	97.7
2ND27705	--	--	--	45.5	48.5	47.0	97.4
Celebration	46.5	45.2	42.0	46.0	49.5	45.8	97.3
ND27177	--	--	43.0	46.0	48.0	45.7	97.2
ND30304	--	--	--	--	47.5	47.5	96.9
2BO5-0811	--	--	--	--	47.5	47.5	96.9
CDC Meredith	--	--	--	--	47.5	47.5	96.9
2ND30879	--	--	--	--	47.5	47.5	96.9
Stout.(ND22421)	46.2	45.8	41.5	46.5	48.0	45.6	96.8

NOTE: Average test weights in this summary should not be compared to each other since they are not grown in the same years. Compare test weights only to the check variety.

Table 10. Relative percent plump of barley varieties as compared to Tradition when grown under sprinkler irrigated conditions at the EARC, Sidney, Montana. Disease in 2011. Hailed out 2013.

Cultivar	2009	2010	2011	2012	2014	average	as % of Tradition
Conlon	94	94	86	88	98	92.0	110.8
Rawson	90	95	90	83	98	91.2	109.9
2ND25276	89	93	87	84	98	90.2	108.7
ND28554	--	--	--	85	99	92.0	107.0
Stellar-ND	85	91	83	83	99	88.2	106.3
Pinnacle	87	93	71	87	99	87.4	105.3
ND28555	--	--	--	82	98	90.0	104.7
Stout (ND22421)	83	92	77	82	99	86.6	104.3
Innovation	90	85	78	79	99	86.2	103.9
Lacey	74	88	84	84	98	85.6	103.1
ND27177	--	--	83	70	99	84.0	101.6
Robust	81	88	77	76	98	84.0	101.2
ND29380	--	--	--	--	99	99.0	101.0
ND30159	--	--	--	--	99	99.0	101.0
2ND30749	--	--	--	--	99	99.0	101.0
Tradition	81	86	76	74	98	83.0	100.0
Conrad	--	--	78	73	97	82.7	100.0
ND30377	--	--	--	--	98	98.0	100.0
ND29196	--	--	--	--	98	98.0	100.0
ND30304	--	--	--	--	98	98.0	100.0
ND30320	--	--	--	--	98	98.0	100.0
M152	--	--	--	--	98	98.0	100.0
2ND30672	--	--	--	--	98	98.0	100.0
2ND30837	--	--	--	--	98	98.0	100.0
2ND30639	--	--	--	--	98	98.0	100.0
2ND30879	--	--	--	--	98	98.0	100.0
ND26891	--	--	74	71	99	81.3	98.4
Quest	79	86	74	73	96	81.6	98.3
2ND30724	--	--	--	--	96	96.0	98.0
Celebration	79	83	68	76	98	80.8	97.3
CDC Meredith	--	--	--	--	95	95.0	96.9
AC Metcalfe	84	84	66	69	98	80.2	96.6
Copeland	73	90	59	76	98	79.2	95.4
2BO5-0811	--	--	--	--	93	93.0	94.9
2ND27705	--	--	--	66	97	81.5	94.8
2ND28065	--	--	--	69	93	81.0	94.2
Hockett	--	--	--	--	92	92.0	93.9

NOTE: Average percent plump in this summary should not be compared to each other since they are not grown in the same years. Compare percent plump only to the check variety.

Table 11. Relative protein contents of barley varieties in percent as compared to Tradition when grown under sprinkler irrigated conditions at the EARC, Sidney, Montana. Disease in 2011. Hailed out in 2013.

Cultivar	2009	2010	2011	2012	2014	average	as % of Tradition
2ND30639	--	--	--	--	14.6	14.6	119.7
Celebration	14.4	12.2	14.6	15.4	13.8	14.1	110.3
M152	--	--	--	--	13.1	13.1	107.4
Robust	13.7	12.8	13.8	14.8	12.6	13.5	106.1
Hockett	--	--	--	--	12.8	12.8	104.9
Quest	13.8	12.1	13.4	14.7	12.7	13.3	104.5
AC Metcalfe	14.0	12.7	13.8	13.8	11.9	13.2	103.8
Conrad	--	--	13.5	15.5	12.2	13.7	103.5
Conlon	13.8	12.5	14.1	13.1	12.5	13.2	103.4
ND28555	--	--	--	13.8	13.6	13.7	103.4
Innovation	13.5	11.3	12.9	14.2	13.1	13.0	101.9
Lacey	14.2	11.9	12.7	13.9	12.0	12.9	101.4
CDC Copeland	13.3	11.1	13.6	15.2	11.2	12.9	100.9
Stellar-ND	13.8	10.8	13.8	13.2	12.7	12.9	100.8
Stout (ND22421)	13.3	11.4	13.5	13.6	12.3	12.8	100.5
ND28554	--	--	--	13.8	12.8	13.3	100.4
Rawson	13.2	11.7	13.4	12.8	12.9	12.8	100.3
Tradition	12.8	11.2	13.3	14.3	12.2	12.8	100.0
CDC Meredith	--	--	--	--	12.2	12.2	100.0
2ND30724	--	--	--	--	12.2	12.2	100.0
ND30304	--	--	--	--	12.1	12.1	99.2
ND27177	--	--	13.6	13.5	12.2	13.1	98.7
2ND30837	--	--	--	--	12.0	12.0	98.4
2ND30672	--	--	--	--	11.9	11.9	97.5
ND26891	--	--	13.7	12.8	11.9	12.8	96.5
ND29196	--	--	--	--	11.7	11.7	95.9
ND30320	--	--	--	--	11.7	11.7	95.9
2ND28065	--	--	--	13.3	12.0	12.7	95.5
ND30377	--	--	--	--	11.6	11.6	95.1
2ND27705	--	--	--	13.7	11.1	12.4	93.6
2BO5-0811	--	--	--	--	11.4	11.4	93.4
2ND30749	--	--	--	--	11.3	11.3	92.6
ND29380	--	--	--	--	11.2	11.2	91.8
Pinnacle	12.6	11.4	12.3	11.6	10.5	11.7	91.5
2ND30879	--	--	--	--	10.8	10.8	88.5
2ND25276	11.8	10.6	10.8	12.6	10.5	11.3	88.2
ND30159	--	--	--	--	10.5	10.5	86.1

NOTE: Average protein contents in this summary should not be compared to each other since they are not grown in the same years. Compare protein contents only to the check variety.

Table 12. Relative lodging indices of barley varieties in percent as compared to Tradition when grown under sprinkler irrigated conditions at the EARC, Sidney, Montana. Disease in 2011. Hailed out in 2013.

Cultivar	2007	2009	2010	2011	2014	average	as % of Tradition
Hockett	--	--	--	--	8.7	8.7	322.2
CDC Meredith	--	--	--	--	6.3	6.3	233.3
M152	--	--	--	--	6.0	6.0	222.2
2ND30639	--	--	--	--	5.7	5.7	211.1
2ND28065	--	--	--	--	4.7	4.7	174.1
2BO5-0811	--	--	--	--	4.3	4.3	159.3
2ND27705	--	--	--	--	4.0	4.0	148.1
ND30320	--	--	--	--	3.7	3.7	137.0
2ND30879	--	--	--	--	3.7	3.7	137.0
Conlon	0.7	3.2	6.0	0.0	6.3	3.2	124.6
Lacey	0.3	6.0	4.3	0.0	5.0	3.1	120.0
Rawson	0.7	5.5	2.3	0.0	7.0	3.1	119.2
Celebration	0.0	5.0	5.7	0.0	4.7	3.1	118.5
Quest	0.7	4.0	5.3	0.0	5.3	3.1	117.7
Stellar-ND	1.0	5.8	5.7	0.0	2.3	3.0	113.8
ND27177	--	--	--	0.0	3.0	1.5	111.1
2ND30837	--	--	--	--	3.0	3.0	111.1
Tradition	0.3	5.0	5.0	0.0	2.7	2.6	100.0
Robust	0.0	5.0	3.7	0.0	3.3	2.4	92.3
CDC Copeland	0.7	6.0	2.3	0.0	2.7	2.3	90.0
Innovation	--	2.2	6.0	0.0	3.0	2.8	88.2
AC Metcalfe	1.0	4.0	1.3	0.0	3.3	1.9	73.8
2ND30724	--	--	--	--	1.7	1.7	63.0
2ND25276	--	4.5	2.0	0.0	1.0	1.9	59.1
Conrad	--	--	--	0.0	1.3	0.7	48.1
ND30377	--	--	--	--	1.3	1.3	48.1
2ND30672	--	--	--	--	1.3	1.3	48.1
Pinnacle	0.0	4.0	1.7	0.0	0.3	1.2	46.2
Stout(ND22421)	0.0	3.5	1.7	0.0	0.7	1.2	45.4
ND26891	--	--	--	0.0	0.7	0.4	25.9
ND28555	--	--	--	--	0.7	0.7	25.9
ND30159	--	--	--	--	0.7	0.7	25.9
2ND30749	--	--	--	--	0.7	0.7	25.9
NR28554	--	--	--	--	0.3	0.3	11.1
ND29196	--	--	--	--	0.3	0.3	11.1
ND30304	--	--	--	--	0.3	0.3	11.1
ND29380	--	--	--	--	0.0	0.0	0.0

NOTE: Average lodging indices in this summary should not be compared to each other since they are not grown in the same years. Compare lodging indices only to the check variety.