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WESTERN REGIONAL SPRING BARLEY NURSERY - 2005 Crop

Preliminary Quality Report

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Detailed Data:

WRSBN	WRDSBN
Aberdeen, ID	Potlatch, ID
Idaho Falls, ID	Soda Springs, ID
Twin Falls, ID	Tetonia, ID
Fairfield, MT	

Appendix:
Methods
Criteria for Quality Score

Samples malted and analyzed by the Cereal Crops Research Unit, Madison, WI

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Nursery samples were received for malting quality evaluation from four experimental stations located in Idaho and Montana. The parentages of the nursery entries are listed in Table 1. Twenty of the 36 entries were new in this year's nursery.

These samples were germinated for 5 days, rotating for 3 minutes every half hour, which should yield malts having modification levels similar to those produced by industry. The malting conditions and analytical methods employed are listed in Appendix A. The criteria and value assignments used to calculate quality scores are listed in Appendix B.

The mean values for 15 quality factors are listed over the four stations located in the Western Region (Table 2) and over all varieties (Table 3). Individual station data are reported in Tables 4 through 7. Evaluations of data from individual locations and overall performance evaluations, derived primarily from Tables 2 and 3, are presented below. Submissions from three Western Regional Dryland Spring Barley Nurseries were submitted, malted and analyzed. The data are presented in Tables 8 through 10, without any evaluation.

Three quarters of the very plump barleys from Aberdeen, ID (Table 4) had unacceptably low protein contents. The extract values were generally good, with a location average of 80.5%. Thirteen soluble protein values were too low, while S/T ratios varied widely, with ten unacceptably low and 20 that exceeded the upper limit. Three quarters of the diastatic power (DP) levels and a third of the free amino nitrogen (FAN) contents were too low, negatively affected by the low total protein (TP) contents. Nearly half of the viscosities and β-glucan contents were too high. A third of the wort turbidities exceeded desired limits. The best performers were Stander, 2B99-2316, Merit, MT000125, 2B99-2039, 2B99-2657, AC Metcalfe, Conrad and 6B99-6639. Stander had a good malt quality profile, except for an elevated S/T ratio. Merit performed well, with an exceptional extract value. Merit's low total protein content negatively affected its S/T ratio. MT000125 scored quite well, but did have an elevated β-glucan level. The low diastatic power value generated would have been much better had this line had higher total protein. 2B99-2039, 2B99-2657, AC Metcalfe and Conrad all had similar quality profiles. These lines had exceptional extract values, but had low total protein and diastatic power values and unacceptably high S/T ratios. 6B99-6639 had an excellent extract value, but had an elevated S/T ratio and a very low diastatic power value.

Half of the barleys from Idaho Falls, ID (Table 5) were too thin, but most protein contents were good. Over half of the extract values were too low. Nearly half of the soluble protein levels fell below desired limits, contributing to 27 S/T ratios that were unacceptably low. A dozen DP and FAN values were too low. Two thirds of the β-glucan levels were too high and 15 viscosities exceeded the desired limit. A quarter of the turbidities were too high. The best performers were Stander, 2B99-2771-1, 2B99-2763-10, 2B99-2039, Stellar and 96RWA1222. Stander had an excellent quality profile achieving a maximum score. 2B99-2771-1, 2B99-2761-10 and 2B99-2039 had excellent quality profiles, with each line's extract value only slightly below "ideal". 2B99-2039 was a bit thin and had a slightly depressed kernel weight. Stellar had a low soluble protein level and this contributed to a low S/T ratio. 96RWA1222 generally showed good malting quality, but note the slightly low diastatic power level and the slightly elevated β-glucan contents.

Most of the barleys from Twin Falls, ID (Table 6) were plump and had good protein levels. Nearly half of the extract values were too low and ten F-C differences exceeded the desired limit. Ten soluble protein and 24 S/T values were unacceptably low. Ten diastatic power values were too low, while most α-amylase values were good. Two thirds of the β-glucan levels and 19 viscosities were unacceptably high. Thirteen FAN values were too low, while ten turbidities were too high. The best performers were Stellar, Stander, 01ST1758 and WA10429-00. Stellar had an excellent quality profile, with the exception of a slightly elevated viscosity. Stander had a good quality profile also, but had slightly elevated soluble protein and β-glucan contents. 01ST1758 had an excellent profile, except for an unacceptably high β-glucan level. WA10429-00 scored fairly well, but had carbohydrate modification issues resulting in elevated viscosity, β-glucan and F-C values.

Most of the very plump barleys from Fairfield, MT (Table 7) had good protein contents. A third of the extract and diastatic power values were too low, and ten F-C differences exceeded the desired limit. For many lines, overall modification was deficient, with about two thirds of the soluble protein levels being unacceptably low, while two thirds of the viscosities and β-glucan contents were too high. Other lines, however, excelled. The best performers were 2B99-2039, 2B99-2316, 98Ab11993, 2B99-2657, WA10701-99 and Harrington. All of the malt quality analyses for 2B99-2039 fell in the "ideal" range resulting in a maximum quality score of 65.

2B99-2316 had only a slightly depressed, but acceptable soluble protein value. 98Ab11993 fell below "ideal" only due to slightly depressed extract and DP values. 2B99-2657 had a slightly depressed diastatic power value and slightly elevated β-glucan contents. WA10701-99 had an unacceptably high β-glucan level when malted using our standard protocol and its extract and diastatic power values were below the range considered "ideal".

Overall, these lines on average did not perform well at any of the locations (Table 2). Best scores were obtained at Fairfield and Aberdeen, followed by Twin Falls and finally Idaho Falls. The barleys from Fairfield were very plump, with excellent kernel weights. Average extract values from Fairfield were good, though not as high as those from Aberdeen. The Fairfield malts were less modified than those of the other locations, resulting in low soluble protein levels and higher viscosities and β-glucan contents. The average total protein content of barleys from Aberdeen was quite low, resulting in enhanced extract values, but very low diastatic power and free amino nitrogen levels. Barleys from Twin Falls were plump and had good kernel weights. The average total protein content was highest at this location, which resulted in much lower extract values compared to Aberdeen (similar plumpness, lower protein). The Idaho Falls barleys had the lowest kernel weight and plumpness of all locations. Most other quality aspects between Idaho Falls and Twin Falls were similar, so the scoring difference between the two locations was mostly due to the lack of plumpness and the slightly lower average extract values of the barley and derived malt from Idaho Falls.

Though no location yielded high quality scores when all lines were included (Table 2), many individual lines performed quite well at all locations resulting in excellent average quality scores (Table 3). They were Stander, 2B99-2039, 2B99-2657, 2B99-2763-10, 2B99-2316, Stellar, 98Ab11993 and WA10701-99. Stander had the highest average quality score, buoyed by a perfect score from Idaho Falls (Table 5), where many other lines performed poorly. Stander was superior to the Morex check for most quality parameters, but as has been noted before, had higher soluble protein and α-amylase values than the check. 2B99-2039 from Fairfield (Table 7) had a perfect quality score and outperformed the Harrington malt check at every location. This line had an excellent average extract, good low F-C, viscosity, turbidity and β-glucan values. Soluble protein, S/T and FAN levels were higher than the check indicating a capacity for rapid protein modification. 2B99-2657 was generally plump, had excellent extract, β-glucan, viscosity,

F-C and turbidity values. Note that this line had elevated α-amylase activity. 2B99-2763-10 was generally plump and had adequate extract contents. Carbohydrate modification was sufficient, with generally good β-glucan, viscosity, and F-C values. Protein modification proceeded a bit more slowly than that of Harrington. 2B99-2316 performed well at three of four locations and outperformed the Harrington check at all locations. This line had balanced modification, but the Idaho Falls malt was under modified using our standard malting protocol. Stellar was the best performer at Twin Falls (Table 6), scored well at Idaho Falls, but its performance tailed off at the other locations where low total protein may have been an issue. Stellar's plumpness, extract and β-glucan values were generally good at all locations, while viscosities were slightly elevated. This line's wort turbidities from Aberdeen and Fairfield were unacceptably high, while turbidities from the Twin Falls and Idaho Falls malts were excellent. 98Ab11993 was plump and had good extract and F-C values. The β-glucan levels were exceptional, but viscosities were slightly high at two locations. This line had lower diastatic power levels than the Harrington check, most likely due to the lower average total protein contents. WA10701-99 had a quality profile similar to the Harrington check, but with slightly lower total protein content and slightly higher extract values. The diastatic power levels were a bit lower than the check, however their DP/TP ratios were similar. The β-glucan contents were consistently lower in WA10701-99 than found in the check.

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Table 1. WRSBN Submission Descriptions

Seed Source	Entry No.		Entry	Parentage	Type	Grade	Years Tested	Cooperator
WSU	1		Steptoe	CI 15229	6 row	feed		Check, Ullrich, Vitkov
WPB	2		Baronesse	PI 568246	2 row	feed		Check, Clark, Cook
USDA-ARS	3		Morex	CI 15773	6 row	malting		Check, Erickson
USDA-ARS	4		Stander	PI 564743	6 row	malting		Check, Erickson
USDA-ARS	5		Harrington	Klages/3/Gazelle/Betzes//Centenial	2 row	malting		Check, Erickson
BARI	6	*	2B99-2039	B1215// MERIT /OXBOW/3/2B88-5330//MERIT/TR129	2 row	malting	0	Cooper, Selmer
BARI	7		2B99-2316	2B91-4947//2B91-4947/2B95-8129	2 row	malting	1	Cooper, Selmer
BARI	8		2B99-2657	2B91-4947//2B91-4947/2B94-5744	2 row	malting	1	Cooper, Selmer
BARI	9	*	2B99-2771-1	MERIT // MERIT / 2B95-8129	2 row	malting	0	Cooper, Selmer
BARI	10	*	2B99-2763-10	MERIT/2B92-5065	2 row	malting	0	Cooper, Selmer
USDA-ARS	11		98Ab11993	90Ab241/Baronesse	2 row	malting	1	Obert
USDA-ARS	12	*	99Ab11073	Colter/M75	2 row	malting	0	Obert
USDA-ARS	13	*	01ST1587	Baronesse*4/STARS 9301B	2 row	feed, RWA rest.	0	Bregitzer
USDA-ARS	14	*	01ST1758	Baronesse*4/STARS 9577B	2 row	feed, RWA rest.	0	Bregitzer
USDA-ARS	15	*	96RWA1222	PI366450/Stander*2//Excel	6 row	malting, RWA rest.	0	Bregitzer
WPB	16		YU 597-432	Baronesse/Orca	2 row	feed	1	Clark, Cook
WPB	17	*	YU501-163	Camas//Baronesse/Globular mutant	2 row	feed	0	Clark, Cook
WPB	18	*	YU501-385	Baronesse/Camas	2 row	feed	0	Clark, Cook
MSU	19	*	MT000047	Chinook/MT920161	2 row	feed/malting	0	Blake/Hensleigh
MSU	20	*	MT000125	MT910189/Lewis	2 row	feed/malting	0	Blake/Hensleigh
MSU	21	*	MT000138	MT920041/Stark	2 row	feed/malting	0	Blake/Hensleigh
NDSU	22		Stellar (ND16301)	Foster//ND12200(Bumper/Hazen//Azure)/6B88-3213	6 row	malting	1	Horsley
NDSU	23		ND19854	ND15403/ND16462	2 row	malting	1	Franckowiak
NDSU	24	*	ND21863	ND18172/ND19130	2 row	malting	0	Franckowiak
PB1	25		PB1-97-2R-7010	PB1-88-2R-801/ND 9147	2 row	feed/malting	1	McProud
USU	26	*	UT99B1669-3243	UT91B706-A-259 X BU585-82	6 row	feed	0	Roche
USU	27	*	UT99B1670-3458	UT91B706-A-259 X DA587-170	6 row	feed	0	Roche
WSU	28		WA 8569-99	7190-86/Baronesse(WA 7642-92)//C2-91-45-16-3	2 row	feed/malting	1	Ullrich, Vitkov
WSU	29		WA 10701-99	Clivia/9448-83(WA 7758-89)//Logan	2 row	feed/malting	1	Ullrich, Vitkov
WSU	30	*	WA 7330-00	WA 7642-92/Baronesse (2-row feed)	2 row	feed	0	Ullrich, Vitkov
WSU	31	*	WA 15279-00	WA 9361-94/Baronesse	2 row	feed	0	Ullrich, Vitkov
WSU	32	*	WA 10429-00	WA 9156-94/Baronesse	2 row	feed	0	Ullrich, Vitkov
WSU	33		99NZ102	12697-94/*ant* 643//939331-91	6 row	feed/malting	1	Wettstein
WSU	34	*	01NZ392	16230-95/*ant* 643//BA6B-95-8253	6 row	feed/malting	0	Wettstein
WSU	35	*	01NZ706	*ant* 643/9130-87//BA6B-95-8253	6 row	feed/malting	0	Wettstein

* new entries

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Table 2 - Station Means* of Barley and Malt Quality Factors for 35 Varieties or Selections**

Location	Kernel Weight (mg)		on 6/64" (%)		Barley Color (Agtron)		Malt Extract (%)		F-C	Wort Color		Barley Protein (%)		Wort Protein (%)		S/T (%)		DP (°ASBC)		Alpha-amylase (20°DU)		Beta-glucan (ppm)		FAN (ppm)		Viscosity (Relative)		Turbidity (Hach)		Quality Score
Aberdeen	41.1	C	92.8	B	69	A	80.3	A	0.9	2.34	A	10.46	D	4.52	A	45.8	A	89	C	56.8	B	220	B	158	B	1.52	B	20.6	A	38
Fairfield	44.6	A	95.3	A	67	B	78.7	B	0.9	2.12	B	11.58	C	4.01	C	36.8	B	114	B	59.9	A	274	A	178	A	1.55	A	16.5	B	39
Idaho Falls	40.2	D	81.5	D	67	B	77.7	D	1.0	1.95	B	12.71	B	4.36	B	36.1	B	122	A	59.9	A	235	B	182	A	1.51	B	14.0	B	34
Twin Falls	43.3	B	88.9	C	68	AB	78.1	C	1.0	1.96	B	13.04	A	4.62	A	36.8	B	120	A	61.4	A	269	A	180	A	1.53	B	13.3	B	36

* Within each column, means followed by the same letter are not significantly different (alpha=0.05), according to Duncan's Multiple Range Test

** Steptoe, Baronesse, Morex, Stander, Harrington, 2B99-2039, 2B99-2316, 2B99-2657, 2B99-2771-1, 2B99-2763-10, 98Ab11993, 99Ab11073, 01ST1587, 01ST1758, 96RWA1222, YU 597-432, YU501-163, YU501-385, MT000047, MT000125, MT000138, Stellar, ND19854, ND21863, PB1-97-2R-7010, UT99-B1669-3243, UT99B1670-3458, WA 8569-99, WA 10701-99, WA 7330-00, WA 15279-00, WA 10429-00, 99NZ102, 01-NZ392, 01NZ706

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Table 3. Varietal Means* of Barley and Malt Quality Factors for all Stations**

Variety or Selection	Kernel Weight (mg)		on 6/64" (%)		Barley Color (Agtron)		Malt Extract (%)		F-C (%)		Wort Color		Barley Protein (%)		Wort Protein (%)		S/T (%)		DP (°ASBC)		Alpha-amylase (20°DU)		Beta-glucan (ppm)		FAN (ppm)		Visc. (Rel.)		Turb. (Hach)		Quality Score
Steptoe	44.1	DEF	91.3	ABCDEF	62	IJKL	74.5	L	2.1	A	4.3	A	10.6	HI	3.06	N	30.7	K	55	Q	32.9	S	710	A	103	K	1.76	A	65.3	A	15
Baronesse	42.8	EFGHIJ	91.5	ABCDEF	68	BCDEFGH	77.1	HIJK	1.2	CDEFG	2.7	CD	11.9	CDEFG	3.51	M	31.9	JK	82	P	45.0	NOPQR	223	HIJKLM	119	IJK	1.54	CDEF	34.8	BCD	25
Morex	36.2	Q	79.4	GH	72	BCD	77.9	FGHIJ	0.7	FGHIJ	2.0	EFGHIJ	13.1	AB	4.60	EFGH	36.9	FGHI	161	A	58.9	IJKL	187	IJKLMNOP	193	CDEF	1.51	EFGHIJKLM	15.2	FGH	36
Stander	37.5	QR	90.1	ABCDEF	74	AB	79.5	BCDE	0.6	GHIJ	2.3	CDEFGH	12.4	BCD	5.27	ABC	44.8	AB	143	BCD	75.6	BCD	134	MNOPQR	254	A	1.48	IJKLM	13.2	FGH	57
Harrington	41.4	IJKLMN	85.6	CDEFG	70	BCDEFG	79.2	BCDEF	0.7	GHIJ	1.5	J	12.4	BCD	5.09	BCD	43.9	ABC	121	FGHIJ	72.3	CDE	216	HIJKLM	218	BC	1.49	GHIJKLM	3.2	H	38
2B99-2039	41.6	IJKLM	91.6	ABCDEF	70	BCDEFG	81.2	A	0.4	IJ	1.9	FGHIJ	12.1	CDEF	5.29	AB	46.1	A	128	DEFG	85.5	A	92	QR	247	AB	1.46	M	3.3	H	53
2B99-2316	41.4	IJKLMN	89.7	ABCDEF	68	BCDEFGH	80.4	AB	0.6	GHIJ	1.7	IJ	12.2	BCDE	4.89	BCDE	43.1	ABC	139	CDE	78.5	ABC	128	MNOPQR	212	BC	1.47	JKLM	4.4	H	49
2B99-2657	40.8	JKLMNOP	88.5	ABCDEF	69	BCDEFG	81.1	A	0.4	J	1.8	GHIJ	11.8	CDEFG	4.87	CDEF	44.0	ABC	123	EFGHI	86.4	A	111	OPQR	189	CDEF	1.47	JKLM	4.3	H	50
2B99-2771-1	40.7	JKLMNOP	90.7	ABCDEF	69	BCDEFG	80.6	AB	0.5	HIJ	1.7	IJ	11.5	DEFGH	4.77	DEFG	44.1	ABC	116	GHIJK	82.0	AB	162	LMNOPQR	195	CDE	1.49	GHIJKLM	4.2	H	46
2B99-2763-10	41.4	IJKLMN	92.9	ABCDE	70	BCDEFG	79.9	ABC	0.5	GHIJ	1.8	HIJ	12.2	CDE	4.80	DEF	42.0	ABCDE	148	ABC	75.7	BCD	120	NOPQR	202	CD	1.47	KLM	5.1	H	50
98Ab11993	42.0	GHIJKL	93.5	ABC	66	EFGHI	80.1	ABC	0.5	HIJ	1.6	J	11.6	DEFG	4.49	FGH	42.0	ABCDE	100	KLMNO	67.0	DEFGHI	74	R	192	CDEF	1.50	FGHIJKLM	3.8	H	47
99Ab11073	39.3	NOPQ	91.0	ABCDEF	70	BCDEFG	79.3	BCDEF	1.1	DEFGHI	1.5	J	10.4	I	3.69	KLM	38.0	DEFGH	100	KLMNO	47.1	MNOPQ	380	CD	138	GHIJK	1.59	C	6.2	H	34
01ST1587	44.6	CDE	94.7	AB	66	DEFGHI	76.9	IJK	1.1	EFGHI	2.9	BC	11.8	CDEFG	3.61	LM	32.4	IJK	98	LMNOP	47.0	MNOPQ	133	MNOPQR	116	IJK	1.52	DEFGHIJ	37.5	BC	31
01ST1758	42.8	EFGHIJ	90.9	ABCDEF	67	CDEFGH	78.3	DEFGH	0.9	FGHIJ	2.4	CDEF	11.8	CDEFG	3.91	KL	35.0	HIJK	95	LMNOP	51.9	LMNO	180	JKLMNOPQ	119	IJK	1.53	DEFGHI	26.0	CDEF	31
96RWA1222	39.5	MNOPQ	83.0	FG	71	BCDEF	79.9	ABC	0.7	FGHIJ	1.9	FGHIJ	11.5	DEFGH	4.34	HIJ	41.0	BCDEF	104	KLMN	60.4	HIJKL	206	HIJKLMN	191	CDEF	1.50	FGHIJKLM	10.2	GH	39
YU 597-432	43.9	DEFGH	89.7	ABCDEF	60	JKL	78.2	EFGHI	1.1	EFGHI	1.5	J	12.5	BCD	4.04	IJK	33.9	HIJK	127	DEFG	59.2	IJKL	171	KLMNOPQ	143	GHIJ	1.49	FGHIJKLM	4.2	H	35
YU501-163	45.6	BCD	92.3	ABCDE	72	BCDE	77.9	FGHIJ	1.0	EFGHIJ	2.0	EFGHIJ	11.8	CDEFG	4.00	JKL	35.4	GHIJK	86	OP	43.0	OPQR	337	DEF	140	GHIJK	1.53	DEFGHI	20.7	EFG	28
YU501-385	45.8	BCD	89.4	ABCDEF	72	BCDE	78.7	CDEFG	1.0	EFGHIJ	1.6	J	11.7	DEFG	4.05	IJK	36.2	GHIJ	87	NOP	50.0	MNOP	277	EFGHI	152	GHI	1.51	EFGHIJKLM	5.9	H	28
MT000047	43.0	EFGHI	91.1	ABCDEF	70	BCDEFG	79.6	BCD	0.7	FGHIJ	1.7	IJ	12.6	BCD	5.27	ABC	44.2	ABC	137	CDEF	71.8	CDEF	231	GHIJKL	246	AB	1.47	IJKLM	4.1	H	44
MT000125	46.4	BC	92.7	ABCDE	65	GHIJ	79.3	BCDEF	1.0	EFGHIJ	1.7	IJ	12.8	ABC	4.87	CDEF	39.8	CDEFG	123	EFGHI	67.5	DEFGHI	259	FGHIJK	216	BC	1.48	HIJKLM	5.8	H	42
MT000138	47.2	B	96.2	A	68	BCDEFGH	80.1	ABC	0.9	EFGHIJ	2.0	EFGHIJ	13.6	A	5.64	A	44.4	ABC	135	CDEF	66.7	DEFGHI	329	DEF	260	A	1.52	EFGHIJKL	5.4	H	42
Stellar	39.2	OPQ	93.9	ABC	78	A	79.4	BCDE	0.6	GHIJ	2.4	CDEFG	11.9	CDEFG	4.69	DEFGH	42.6	ABCD	157	AB	63.0	FGHIJ	97	PQR	203	CD	1.51	EFGHIJKLM	23.5	DEFG	49
ND19854	44.7	CDE	93.9	ABC	65	GHIJ	79.5	BCDE	0.9	FGHIJ	2.3	CDEFGH	12.0	CDEFG	4.30	HIJ	37.8	EFGH	127	DEFG	54.1	JKLM	363	CDE	158	FGH	1.53	DEFGH	31.1	BCDE	44
ND21863	49.6	A	96.4	A	65	GHIJ	80.0	ABC	0.6	GHIJ	1.5	J	11.3	EFGHI	4.37	HIJ	41.1	BCDEF	108	IJKLM	53.1	KLMN	218	HIJKLM	173	DEFG	1.50	FGHIJKLM	5.8	H	45
PB1-97-2R-7010	47.5	B	93.2	ABCD	63	HIJK	76.7	JK	1.6	ABCDE	1.4	J	13.1	AB	3.82	KLM	31.0	K	110	HIJKL	41.1	PQRS	423	C	130	HIJK	1.52	DEFGHIJK	7.2	H	25
UT99B1669-3243	41.4	IJKLMN	94.1	ABC	58	KL	76.1	K	1.8	ABC	3.3	B	11.0	GHI	3.41	M	32.3	IJK	91	MNOP	37.6	RS	615	B	105	K	1.67	B	44.0	B	22
UT99B1670-3458	41.0	IJKLMNO	92.9	ABCDE	57	L	76.1	K	1.7	ABCD	3.2	B	11.1	FGHI	3.47	M	32.9	IJK	97	LMNOP	39.1	QRS	575	B	113	JK	1.66	B	43.0	B	21
WA 8569-99	41.9	HIJKL	84.6	DEFG	69	BCDEFG	77.0	HIJK	1.9	AB	2.5	CDEF	11.8	CDEFG	3.66	KLM	32.3	IJK	87	NOP	43.4	OPQR	315	DEFG	130	HIJK	1.57	CD	31.8	BCDE	20
WA 10701-99	42.4	FGHIJK	86.7	BCDEFG	69	BCDEFG	80.6	AB	0.8	FGHIJ	1.6	J	11.7	DEFG	4.92	BCDE	46.4	A	107	IJKLM	69.4	DEFGH	173	KLMNOPQ	204	CD	1.46	LM	4.4	H	47
WA 7330-00	40.1	LMNOP	86.9	BCDEFG	67	CDEFGHI	77.5	GHIJ	1.0	EFGHIJ	2.5	CDE	11.7	DEFG	3.63	LM	32.6	IJK	92	MNOP	47.3	MNOPQ	221	HIJKLM	120	IJK	1.54	CDEFG	31.0	BCDE	23
WA 15279-00	44.0	DEFG	87.9	ABCDEF	73	BC	77.8	GHIJ	1.1	EFGHI	1.9	FGHIJ	11.3	EFGHI	3.50	M	32.9	IJK	67	Q	41.4	PQRS	269	FGHIJ	119	IJK	1.57	CD	16.2	FGH	22
WA 10429-00	41.2	IJKLMNO	83.4	FG	66	FGHI	79.3	BCDEF	1.2	DEFGH	2.2	DEFGHI	12.3	BCDE	4.91	BCDE	43.0	ABC	105	JKLM	65.5	EFGHI	294	DEFGH	214	BC	1.54	DEFGH	14.6	FGH	41
99NZ102	38.9	PQ	75.0	H	67	CDEFGHI	76.9	HIJK	1.0	EFGHIJ	2.5	CDEF	12.0	CDEFG	5.02	BCD	43.2	ABC	109	IJKL	69.0	DEFGH	195	IJKLMNO	213	BC	1.53	DEFGH	15.2	FGH	31
01NZ392	37.8	QR	84.1	EFG	68	BCDEFGH	79.2	BCDEF	0.9	EFGHIJ	2.4	CDEFG	11.9	CDEFG	4.85	DEF	44.0	ABC	96	LMNOP	69.9	CDEFG	210	HIJKLMN	200	CDE	1.56	CDE	10.7	GH	38
01NZ706	40.3	KLMNOP	89.9	ABCDEF	72	BCDE	78.2	DEFGHI	1.4	BCDEF	1.6	J	11.1	FGHI	4.40	GHI	42.3	ABCDE	125	EFGH	61.6	GHIJK	101	PQR	165	EFGH	1.47	JKLM	4.9	H	40

* Within each column, means followed by the same letter are not significantly different (alpha=0.05), according to Duncan's Multiple Range Test

** Aberdeen, ID, Idaho Falls, ID, Fairfield, ID, and Twin Falls, ID

2005 WESTERN REGIONAL SPRING BARLEY NURSERY AND ADDITIONS - ABERDEEN, ID

Table 4

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity (relative)	Turbidity (NTU)	pH	Quality Score	Overall Rank
5831	Steptoe	6	45.5	98.1	65	77.1	2.4	n.d.	3	9.8	3.37	38.2	48	34.7	636	90	1.69	73.0	6.18	15	40
5832	Baronesse	2	41.2	93.8	72	79.4	1.4	n.d.	3	9.4	3.57	41.2	59	46.7	118	91	1.51	47.0	6.04	31	31
5833	Morex	6	35.8	76.6	76	79.6	0.8	n.d.	3	11.3	4.57	42.5	125	52.2	103	187	1.46	23.0	5.97	46	10
5834	Stander	6	35.7	89.8	77	79.6	0.6	n.d.	3	11.9	4.93	43.5	127	55.6	116	172	1.46	33.0	5.89	56	1
5835	Harrington	2	40.4	96.6	72	81.7	0.6	1.5	1	10.7	5.26	52.1	98	67.5	113	179	1.47	2.5	5.89	43	18
5836	2B99-2039	2	40.2	95.9	70	82.8	0.3	2.0	1	10.6	5.46	53.5	96	80.3	56	230	1.45	3.2	5.84	47	5
5837	2B99-2316	2	39.7	93.5	66	81.6	0.2	2.0	1	11.5	5.30	50.4	114	73.2	138	202	1.46	3.9	5.83	50	2
5838	2B99-2657	2	40.0	94.8	71	83.3	0.4	1.9	1	10.0	5.23	54.3	95	81.2	86	196	1.46	3.4	5.83	47	5
5839	2B99-2771-1	2	39.4	91.5	66	82.3	0.7	1.7	1	10.0	4.92	50.4	88	73.6	153	183	1.48	3.6	5.84	38	27
5840	2B99-2763-10	2	39.2	92.8	70	80.9	0.1	2.0	1	11.0	5.21	50.3	122	70.2	132	178	1.46	5.0	5.80	45	13
5841	98Ab11993	2	40.0	96.6	69	82.1	0.6	1.4	1	9.2	4.30	51.0	77	59.2	55	152	1.50	2.9	5.99	41	22
5842	99Ab11073	6	39.3	94.3	72	80.7	1.4	1.4	1	9.8	3.90	43.2	85	46.1	394	147	1.60	4.4	5.95	39	23
5843	01ST1587	2	42.8	96.5	69	78.3	0.9	n.d.	3	9.9	3.76	39.4	80	44.0	102	117	1.51	59.0	5.99	26	32
5844	01ST1758	2	41.8	95.3	69	79.1	1.6	n.d.	3	10.6	3.88	38.2	74	43.5	124	81	1.52	42.0	5.96	25	34
5845	96RWA1222	6	36.5	79.2	74	82.8	0.8	1.6	1	9.7	4.84	54.7	93	65.6	85	214	1.44	2.6	5.83	42	19
5846	YU 597-432	2	41.9	87.6	60	79.6	1.6	1.5	1	10.7	4.19	39.3	102	53.5	179	130	1.50	4.5	5.89	35	30
5847	YU501-163	2	42.9	95.8	72	79.0	1.1	n.d.	3	10.7	4.34	41.8	66	44.3	348	138	1.53	27.0	5.87	26	32
5848	YU501-385	2	43.4	88.5	73	80.7	0.8	1.5	1	10.1	4.16	43.4	71	48.5	237	154	1.50	5.2	5.91	37	28
5849	MT000047	2	42.1	96.0	73	81.8	0.4	1.5	1	9.9	5.00	51.8	106	64.9	171	203	1.47	2.5	5.85	45	13
5850	MT000125	2	45.0	96.7	63	80.7	1.0	1.4	1	11.5	4.91	44.2	99	64.4	240	207	1.48	3.4	5.84	48	4
5851	MT000138	2	46.6	98.7	66	81.7	0.8	2.3	1	11.6	5.75	53.8	98	65.6	402	226	1.53	7.1	5.67	42	19
5853	Stellar (ND16301)	6	37.3	92.6	77	80.7	0.3	n.d.	3	9.9	4.54	48.6	116	59.9	110	166	1.52	47.0	5.89	39	23
5854	ND19854	2	45.0	98.1	63	80.0	0.2	n.d.	3	11.2	4.43	40.9	119	53.5	419	126	1.56	41.0	5.86	45	13
5855	ND21863	2	48.5	98.4	66	81.3	0.4	1.6	1	10.0	4.53	46.3	83	54.9	220	176	1.49	6.2	5.83	46	10
5856	PB1-97-2R-7010	2	47.2	97.8	65	79.1	1.2	1.4	1	11.3	4.14	38.3	111	41.4	326	124	1.51	5.0	5.92	37	28
5857	UT99B1669-3243	6	40.7	95.5	61	77.2	1.8	n.d.	3	10.4	3.68	38.4	75	38.5	625	81	1.68	58.0	6.09	19	38
5858	UT99B1670-3458	6	39.6	94.5	60	77.0	1.7	n.d.	3	10.0	3.61	36.8	84	39.2	611	94	1.69	51.0	6.08	19	38
5859	WA 8569-99	2	41.3	94.3	72	79.2	1.4	n.d.	3	10.0	3.72	39.3	67	41.3	216	109	1.55	50.0	6.07	22	37
5860	WA 10701-99	2	43.2	95.0	71	82.3	0.5	1.8	1	10.2	5.12	55.7	75	71.5	131	179	1.46	5.8	5.89	44	16
5861	WA 7330-00	2	39.5	94.0	70	79.7	0.7	n.d.	3	9.8	3.65	38.5	69	44.7	241	106	1.57	45.0	6.05	23	35

Table 4

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity (relative)	Turbidity (NTU)	pH	Quality Score	Overall Rank
5862	WA 15279-00	2	42.8	94.2	76	79.0	0.3	n.d.	3	9.8	3.60	38.7	51	40.4	203	104	1.57	23.0	6.09	23	35
5863	WA 10429-00	2	40.6	94.9	70	81.9	1.3	2.2	2	10.5	4.99	51.0	80	64.3	244	179	1.54	11.3	5.88	39	23
5864	99NZ102	6	37.5	76.6	69	78.2	1.0	2.3	1	11.0	5.24	51.3	90	71.8	154	207	1.48	7.2	5.99	39	23
5865	01NZ392	6	37.2	84.0	70	80.7	1.1	2.7	1	11.0	5.49	53.9	69	72.4	149	228	1.55	7.6	5.82	44	16
5866	01NZ706	6	38.8	90.1	71	79.0	2.0	1.8	1	11.0	4.69	46.8	109	60.7	68	157	1.46	4.6	5.99	46	10
5867	ACMetcalfe	2	40.3	97.3	75	82.5	0.4	1.9	1	10.6	5.32	52.5	100	85.8	58	181	1.45	3.5	5.87	47	5
5868	Conrad	2	41.1	97.5	71	81.9	0.5	1.6	1	10.7	4.92	49.2	99	71.7	83	197	1.48	4.0	5.88	47	5
5869	Merit	2	39.2	92.0	75	82.4	0.4	1.6	1	9.9	4.89	52.9	106	92.7	94	214	1.47	2.6	5.99	49	3
5870	6B00-1323	6	35.3	73.0	76	81.7	0.7	1.6	1	9.8	5.15	55.3	113	70.9	66	184	1.47	3.0	5.93	42	19
5871	6B99-6639	6	38.2	77.7	72	80.2	2.0	1.9	1	12.2	5.95	51.1	113	69.0	94	210	1.48	4.8	5.77	47	5
5852	HARRINGTON MALT CHECK	2	37.6	85.0	80	81.4	0.5	1.6	1	13.0	6.10	50.6	131	80.2	162	279	1.50	3.9	5.87	39	
Minima			35.3	73.0	60	77.0	0.1	1.4		9.2	3.37	36.8	48	34.7	55	81	1.44	2.5	5.67	15	
Maxima			48.5	98.7	77	83.3	2.4	2.7		12.2	5.95	55.7	127	92.7	636	230	1.69	73.0	6.18	56	
Means			40.8	92.2	70	80.5	0.9	1.8		10.5	4.61	46.6	91	59.5	202	162	1.51	18.5	5.92	39	
Standard Deviations			3.1	6.7	5	1.7	0.6	0.3		0.7	0.68	6.2	21	14.6	156	45	0.06	20.9	0.10	10	
Coefficients of Variation			7.7	7.3	7	2.1	64.3	19.2		6.8	14.84	13.3	23	24.5	77	27	4.23	113.2	1.75	26	

Malt Check Data are Excluded from Rank Sorting and Statistics
Table Data Flagged by an Asterisk Exceed the Mean by +/- 3 Standard Deviations and are Excluded from Statistics
For Wort Clarity - 1 = clear, 2 = slightly hazy, 3 = hazy; Wort Colors were not determined (n.d.) on hazy samples

Samples Submitted by D. Obert, USDA/ARS - Aberdeen, ID

2005 WESTERN REGIONAL SPRING BARLEY NURSERY - IDAHO FALLS, ID

Table 5

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity	Turbidity	pH	Quality Score	Overall Rank
4838	B1202	2	40.5	76.5	62	76.0	1.0	1.5	1	15.1	4.77	32.9	125	62.5	204	203	1.50	4.0	5.92	27	21
4839	Steptoe	6	40.8	79.7	61	72.6	1.9	n.d.	3	11.4	2.96	27.6	54	29.9	*768	103	1.82	*73.0	*6.28	13	34
4840	Baronesse	2	40.3	82.6	69	75.5	1.1	n.d.	3	13.4	3.52	27.4	86	44.6	242	128	1.56	28.0	6.02	13	34
4841	Morex	6	35.5	67.0	70	76.7	1.0	1.7	1	13.8	4.82	37.0	180	62.8	159	224	1.49	8.4	5.94	32	18
4842	Stander	6	36.2	84.8	73	79.6	0.4	2.4	1	12.6	5.47	46.1	152	86.1	91	297	1.47	8.4	5.84	65	1
4843	Harrington	2	38.5	63.8	68	77.5	1.1	1.5	1	13.9	5.13	39.2	138	74.7	235	235	1.48	3.4	5.90	25	23
4844	2B99-2039	2	40.0	84.8	66	80.3	0.5	1.8	1	12.5	5.29	43.7	147	83.4	76	251	1.45	3.4	5.91	54	4
4845	2B99-2316	2	40.6	82.4	67	79.6	0.9	1.7	1	13.0	4.85	39.9	154	76.0	157	226	1.51	5.3	5.92	39	13
4846	2B99-2657	2	40.6	82.5	69	80.3	0.7	1.7	1	12.8	4.78	39.9	137	88.4	91	196	1.48	5.3	5.93	51	7
4848	2B99-2771-1	2	40.4	91.6	65	80.4	0.5	1.7	1	12.6	4.96	42.5	125	86.0	80	243	1.47	4.8	5.87	61	2
4847	2B99-2763-10	2	41.6	91.3	65	79.8	0.4	1.6	1	12.3	4.85	40.9	158	77.6	49	206	1.47	5.8	5.89	61	2
4850	98Ab11993	2	39.9	88.6	64	79.0	0.6	1.4	1	12.8	4.53	37.1	103	64.8	85	192	1.52	3.9	5.92	46	8
4851	99Ab11073	6	37.5	85.6	74	78.5	1.0	1.5	1	10.4	3.63	36.3	101	46.0	357	141	1.58	7.3	5.93	31	20
4852	01ST1587	2	43.1	90.0	65	76.1	1.3	2.5	2	12.9	3.62	30.1	109	47.7	102	127	1.51	27.0	6.02	35	14
4853	01ST1758	2	40.4	80.9	70	76.2	0.9	2.4	2	12.2	3.58	30.4	90	44.0	176	119	1.55	28.0	6.03	19	30
4854	96RWA1222	6	38.7	78.3	70	80.3	0.3	1.6	1	11.7	4.91	44.0	121	73.4	153	220	1.48	3.5	5.85	52	6
4855	YU 597-432	2	42.4	85.4	64	77.3	1.1	1.2	1	13.3	3.99	31.9	140	59.8	107	147	1.46	3.1	5.94	32	18
4856	YU501-163	2	43.8	85.2	73	76.7	0.7	1.4	1	12.4	3.95	33.7	97	43.3	241	148	1.48	7.7	5.96	24	24
4857	YU501-385	2	44.0	84.5	71	77.8	0.8	1.3	1	12.2	4.03	33.7	96	52.2	246	153	1.48	6.2	5.96	27	21
4858	MT000047	2	41.5	86.0	66	78.7	0.3	1.7	1	13.3	5.32	42.3	163	79.3	184	274	1.43	5.0	5.85	44	9
4859	MT000125	2	44.3	86.9	65	78.8	1.2	1.9	1	13.7	4.98	38.2	147	70.5	225	224	1.45	7.7	5.82	35	14
4860	MT000138	2	45.3	92.1	66	79.8	0.9	1.8	1	14.1	5.61	42.5	158	70.2	247	269	1.47	5.3	5.82	41	11
4861	Stellar (ND16301)	6	38.4	93.6	77	79.2	1.1	1.5	1	12.2	4.64	41.3	179	63.4	69	203	1.48	6.4	5.93	53	5
4862	ND19854	2	41.0	88.3	63	77.8	1.1	n.d.	3	12.5	4.10	34.5	130	46.6	422	154	1.51	35.0	5.93	34	16
4863	ND21863	2	48.3	95.4	63	79.3	0.8	1.4	1	11.8	4.15	37.7	118	48.9	188	158	1.50	5.9	5.93	40	12
4864	PB1-97-2R-7010	2	44.4	84.0	63	75.3	1.6	1.4	1	14.1	3.72	27.3	115	40.7	461	132	1.49	8.4	6.04	15	31
4865	UT99B1669-3243	6	39.6	91.8	57	75.4	1.6	n.d.	3	11.6	3.43	30.3	106	37.2	541	117	1.57	34.0	6.13	24	24
4866	UT99B1670-3458	6	39.0	86.8	53	75.1	1.8	n.d.	3	12.2	3.61	30.5	103	38.9	539	120	1.59	43.0	6.17	24	24
4867	WA 8569-99	2	36.6	63.3	69	75.2	2.1	2.3	2	12.5	3.64	29.8	90	42.1	344	158	1.56	27.0	6.07	15	31
4868	WA 10701-99	2	39.3	74.8	67	79.3	0.8	1.5	1	12.5	4.76	40.5	126	64.0	172	177	1.46	4.1	5.93	44	9

Table 5

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity	Turbidity	pH	Quality Score	Overall Rank
4869	WA 7330-00	2	37.3	75.7	64	76.0	1.3	2.1	2	12.8	3.64	28.9	100	48.0	246	119	1.51	20.0	6.00	22	29
4870	WA 15279-00	2	41.0	74.0	71	76.2	1.8	1.5	2	13.1	3.49	28.5	70	40.4	292	132	1.55	9.8	6.09	14	33
4871	WA 10429-00	2	36.7	55.6	60	75.9	1.0	1.9	1	14.8	4.98	35.3	129	64.5	319	248	1.49	7.3	5.97	23	27
4872	99NZ102	6	36.0	59.2	70	76.2	1.1	2.2	2	12.0	4.69	39.7	115	70.3	171	190	1.51	11.7	6.03	23	27
4874	01NZ392	6	34.8	72.8	73	78.4	0.9	2.1	2	12.5	4.61	38.9	115	69.5	170	170	1.57	12.9	5.96	33	17
4849	MOREX MALT CHECK	6	34.7	87.9	78	79.4	0.3	2.5	1	12.4	5.75	50.1	139	72.4	28	277	1.47	6.5	5.75	53	
4873	MOREX MALT CHECK	6	35.5	88.4	72	79.6	0.2	2.3	1	12.3	5.67	49.4	140	72.7	27	201	1.45	7.1	5.83	60	
Minima			34.8	55.6	53	72.6	0.3	1.2		10.4	2.96	27.3	54	29.9	49	103	1.43	3.1	5.82	13	
Maxima			48.3	95.4	77	80.4	2.1	2.5		15.1	5.61	46.1	180	88.4	541	297	1.82	43.0	6.17	65	
Means			40.2	81.3	67	77.6	1.0	1.7		12.8	4.37	36.0	122	59.9	219	183	1.51	12.0	5.95	34	
Standard Deviations			3.0	9.9	5	2.0	0.4	0.4		1.0	0.70	5.5	29	16.4	129	52	0.07	11.0	0.08	15	
Coefficients of Variation			7.5	12.2	7	2.5	44.3	20.6		7.5	15.97	15.3	24	27.3	59	29	4.49	91.9	1.41	43	

Malt Check Data are Excluded from Rank Sorting and Statistics

Table Data Flagged by an Asterisk Exceed the Mean by +/- 3 Standard Deviations and are Excluded from Statistics

For Wort Clarity - 1 = clear, 2 = slightly hazy, 3 = hazy; Wort Colors were not determined (n.d.) on hazy samples

Samples Submitted by D. B. Cooper, BARI - Ft. Collins

2005 WESTERN REGIONAL SPRING BARLEY NURSERY - TWIN FALLS, ID

Table 6

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity	Turbidity	pH	Quality Score	Overall Rank
4875	B1202	2	41.7	84.1	69	76.1	1.8	1.5	1	15.0	4.61	32.7	116	60.1	390	219	1.52	4.3	5.94	24	25
4876	Steptoe	6	43.4	90.6	60	73.5	2.8	n.d.	3	11.5	3.19	28.8	60	32.4	*717	121	*1.68	51.0	6.21	15	32
4877	Baronesse	2	44.2	92.6	64	77.0	1.6	n.d.	3	12.5	3.74	30.6	90	45.5	248	141	1.52	28.0	5.96	27	24
4878	Morex	6	37.0	84.1	67	77.4	0.7	1.6	1	14.7	5.01	35.5	189	65.8	186	157	1.48	5.4	5.92	29	23
4879	Stander	6	39.6	91.9	74	79.7	1.1	1.9	1	13.3	5.90	46.0	152	86.4	131	298	1.47	4.2	5.85	57	2
4880	Harrington	2	43.1	85.8	67	77.7	0.1	1.5	1	13.9	5.31	38.9	137	75.1	289	246	1.49	4.3	5.88	31	20
4881	2B99-2039	2	40.8	87.9	69	80.0	0.6	1.9	1	13.5	5.33	41.1	142	85.9	171	246	1.49	4.1	5.92	47	6
4882	2B99-2316	2	42.3	88.4	67	79.5	0.9	1.6	1	13.2	5.06	39.8	154	84.1	117	214	1.46	5.0	5.95	46	9
4883	2B99-2657	2	40.1	81.8	75	79.7	0.3	1.6	1	13.3	4.90	37.8	144	91.1	128	149	1.47	4.4	5.98	42	12
4885	2B99-2771-1	2	39.5	82.9	68	78.4	0.2	1.5	1	13.0	4.92	39.5	144	82.8	272	153	1.51	4.3	5.95	34	17
4884	2B99-2763-10	2	42.2	91.9	71	79.0	1.1	1.7	1	13.4	4.73	37.5	160	77.2	137	207	1.47	5.2	5.94	45	10
4886	98Ab11993	2	41.8	91.1	65	78.8	0.4	1.8	1	13.3	4.64	37.0	111	71.4	125	210	1.52	4.7	5.97	41	13
4887	99Ab11073	6	40.7	90.8	71	79.3	0.8	1.5	1	11.1	3.96	37.7	122	53.7	286	130	1.55	6.0	5.98	38	15
4888	01ST1587	2	45.1	94.6	66	76.0	0.7	n.d.	3	12.9	3.77	30.2	102	49.7	198	106	1.55	31.0	5.99	31	20
4889	01ST1758	2	42.6	90.6	68	80.8	0.4	1.6	1	12.7	4.98	42.4	127	76.6	214	165	1.50	3.0	5.87	55	3
4890	96RWA1222	6	42.0	81.8	75	77.0	0.8	n.d.	3	12.5	3.65	30.4	90	42.2	256	142	1.57	31.0	6.03	24	25
4891	YU 597-432	2	43.7	88.9	63	77.4	0.4	1.8	1	13.3	4.17	32.6	132	62.1	177	143	1.50	5.9	5.91	32	19
4892	YU501-163	2	47.8	92.3	72	78.0	1.3	n.d.	3	12.5	4.06	34.5	87	41.8	390	135	1.55	26.0	5.91	31	20
4893	YU501-385	2	46.8	88.3	73	77.1	1.0	1.2	1	13.8	4.30	32.2	95	48.5	334	156	1.51	3.8	5.94	20	29
4894	MT000047	2	43.0	87.0	72	78.7	0.9	1.6	1	13.5	5.54	42.0	140	70.2	284	233	1.50	4.2	5.84	45	10
4895	MT000125	2	47.4	90.9	62	78.8	0.4	2.0	1	13.3	5.12	39.7	117	69.4	276	211	1.50	8.2	5.84	39	14
4896	MT000138	2	48.7	96.9	69	79.1	0.7	1.9	1	15.0	5.85	40.4	147	64.5	305	257	1.55	5.6	5.81	38	15
4898	Stellar (ND16301)	6	41.3	95.3	77	79.0	0.3	1.7	1	13.5	5.44	42.7	165	68.3	62	243	1.51	5.4	5.85	60	1
4899	ND19854	2	46.2	93.3	71	80.1	1.1	1.8	2	12.6	4.73	38.8	130	60.4	288	176	1.53	14.4	5.84	49	5
4900	ND21863	2	50.6	94.2	67	79.2	0.2	1.5	1	12.2	4.68	39.4	109	54.8	131	180	1.48	5.5	5.83	47	6
4901	PB1-97-2R-7010	2	48.8	92.9	64	75.6	2.1	1.6	1	14.6	3.97	28.8	99	40.5	513	139	1.53	9.3	5.99	16	31
4902	UT99B1669-3243	6	42.8	93.1	60	75.6	1.8	n.d.	3	11.6	3.43	30.2	88	36.3	*657	109	1.64	45.0	6.14	24	25
4903	WA 8569-99	2	43.4	84.9	68	76.4	2.3	2.1	2	13.1	3.80	29.9	94	44.1	414	127	1.57	23.0	6.03	15	32
4904	WA 10701-99	2	42.5	84.8	65	80.1	1.4	1.6	1	12.7	5.23	44.4	114	67.1	223	232	1.47	4.1	5.91	47	6
4905	WA 7330-00	2	40.8	82.4	67	76.6	1.2	2.2	2	13.3	3.97	31.2	95	48.1	236	141	1.50	23.0	5.97	17	30

Table 6

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity	Turbidity	pH	Quality Score	Overall Rank
4906	WA 15279-00	2	45.7	89.0	73	77.5	1.7	1.7	2	11.8	3.56	31.6	72	39.8	359	120	1.58	13.4	6.12	23	28
4907	WA 10429-00	2	42.6	90.1	68	79.9	1.7	2.0	1	12.3	5.09	43.4	107	63.9	299	223	1.53	10.9	5.94	52	4
4908	99NZ102	6	39.5	*73.6	62	76.1	1.6	*3.1	2	13.5	5.73	43.0	124	66.4	202	260	1.56	26.0	5.93	33	18
4897	MOREX MALT CHECK	6	34.7	85.6	76	79.5	0.2	2.2	1	12.4	5.78	48.7	123	69.5	115	262	1.50	6.7	5.85	53	
Minima			37.0	81.8	60	73.5	0.1	1.2		11.1	3.19	28.8	60	32.4	62	106	1.46	3.0	5.81	15	
Maxima			50.6	96.9	77	80.8	2.8	2.2		15.0	5.90	46.0	189	91.1	513	298	1.64	51.0	6.21	60	
Means			43.3	89.2	68	78.0	1.0	1.7		13.1	4.62	36.7	120	61.4	246	181	1.52	13.0	5.94	36	
Standard Deviations			3.1	4.2	4	1.7	0.7	0.2		0.9	0.75	5.2	29	16.2	102	52	0.04	12.8	0.09	13	
Coefficients of Variation			7.2	4.7	6	2.2	64.0	13.0		7.2	16.23	14.1	24	26.4	42	29	2.66	98.3	1.51	36	

Malt Check Data are Excluded from Rank Sorting and Statistics

Table Data Flagged by an Asterisk Exceed the Mean by +/- 3 Standard Deviations and are Excluded from Statistics

For Wort Clarity - 1 = clear, 2 = slightly hazy, 3 = hazy; Wort Colors were not determined (n.d.) on hazy samples

Samples Submitted by D. B. Cooper, BARI - Ft. Collins

2005 WESTERN REGIONAL SPRING BARLEY NURSERY - FAIRFIELD, MT

Table 7

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity	Turbidity	pH	Quality Score	Overall Rank
4801	B1202	2	44.1	96.7	69	78.4	1.0	1.4	1	12.1	4.14	35.4	113	61.9	304	182	1.55	3.2	5.85	40	17
4802	Steptoe	6	46.9	96.8	60	74.8	1.5	n.d.	3	9.8	2.72	28.2	58	34.7	719	98	*1.84	64.0	6.21	15	36
4803	Baronesse	2	45.6	97.1	68	76.4	0.8	n.d.	3	12.2	3.20	28.3	94	43.1	284	116	1.58	36.0	6.01	24	32
4804	Morex	6	36.4	89.9	75	78.0	0.4	n.d.	3	12.7	3.99	32.7	151	54.9	300	205	1.61	24.0	6.01	38	20
4805	Stander	6	38.7	94.0	70	79.1	0.4	2.0	1	11.8	4.77	43.5	140	74.2	199	250	1.51	7.2	5.90	51	7
4806	Harrington	2	43.6	96.2	74	80.2	0.9	1.5	1	11.3	4.68	45.4	110	71.8	229	213	1.51	2.5	5.90	52	5
4807	2B99-2039	2	45.4	97.8	76	81.5	0.4	1.9	1	11.9	5.09	46.2	128	92.2	67	263	1.44	2.6	5.87	65	1
4808	2B99-2316	2	43.0	94.5	72	81.1	0.4	1.8	1	11.3	4.36	42.4	134	80.6	99	206	1.46	3.2	5.94	61	2
4809	2B99-2657	2	42.3	94.7	62	81.3	0.2	2.1	1	11.2	4.55	44.2	116	85.0	137	215	1.47	4.2	5.88	58	4
4811	2B99-2771-1	2	43.6	96.6	75	81.4	0.6	1.7	1	10.5	4.28	44.0	106	85.6	141	202	1.49	3.9	5.88	49	10
4810	2B99-2763-10	2	42.8	95.5	72	79.8	0.5	1.7	1	11.9	4.41	39.3	155	77.9	161	215	1.48	4.2	5.90	50	8
4812	98Ab11993	2	46.2	97.6	66	80.6	0.3	1.7	1	11.2	4.48	42.9	108	72.7	31	212	1.48	3.8	5.90	59	3
4813	99Ab11073	6	39.8	93.1	63	78.6	1.4	1.5	1	10.2	3.26	35.0	91	42.6	482	135	1.60	7.0	6.01	28	26
4814	01ST1587	2	47.3	97.7	65	77.0	1.3	n.d.	3	11.4	3.28	30.0	99	46.8	131	114	1.53	33.0	6.01	30	24
4815	01ST1758	2	46.5	96.9	62	77.1	0.8	n.d.	3	11.6	3.18	28.9	89	43.6	206	110	1.54	31.0	6.02	24	32
4816	96RWA1222	6	40.9	92.8	66	79.4	1.0	1.6	1	12.2	3.94	35.0	111	60.7	329	190	1.53	3.5	5.92	39	19
4817	YU 597-432	2	47.6	96.7	53	78.3	1.2	1.4	1	12.6	3.83	31.8	134	61.3	221	153	1.50	3.4	5.96	40	17
4818	YU501-163	2	47.9	95.8	70	78.0	0.9	2.0	2	11.6	3.64	31.9	94	42.5	368	139	1.55	22.0	5.94	25	31
4819	YU501-385	2	49.0	96.1	70	79.2	1.4	2.3	1	10.8	3.70	35.7	86	50.8	291	145	1.52	8.4	5.95	28	26
4820	MT000047	2	45.4	95.5	67	79.2	1.2	1.9	1	13.6	5.21	40.6	141	72.7	283	272	1.50	4.7	5.88	42	15
4821	MT000125	2	49.0	96.4	69	78.8	1.6	1.6	1	12.6	4.45	37.1	131	65.7	295	222	1.50	3.9	5.93	47	11
4822	MT000138	2	48.2	96.9	72	79.7	1.4	2.1	1	13.8	5.35	40.7	137	66.5	362	287	1.52	3.7	5.83	45	13
4823	Stellar (ND16301)	6	39.6	94.1	80	78.7	0.7	n.d.	3	11.9	4.15	37.7	166	60.2	149	199	1.54	35.0	5.97	44	14
4824	ND19854	2	46.4	95.9	64	79.9	1.1	n.d.	3	11.5	3.93	37.1	128	56.0	324	175	1.53	34.0	5.92	41	16
4826	ND21863	2	51.1	97.5	62	80.4	0.9	1.4	1	11.0	4.11	40.8	120	53.7	333	180	1.51	5.7	5.91	46	12
4827	PB1-97-2R-7010	2	49.7	98.0	59	76.9	1.5	1.3	1	12.6	3.44	29.7	117	41.6	394	126	1.55	6.1	6.02	30	24
4828	UT99B1669-3243	6	42.6	96.0	55	76.0	2.2	n.d.	3	10.5	3.11	30.2	96	38.5	638	113	*1.77	39.0	6.15	19	34
4829	UT99B1670-3458	6	44.5	97.3	59	76.2	1.7	n.d.	3	11.0	3.18	31.2	105	39.3	575	124	*1.73	35.0	6.16	19	34
4830	WA 8569-99	2	46.3	95.8	65	77.4	1.9	n.d.	3	11.7	3.46	30.4	97	46.1	285	128	1.61	27.0	6.06	27	29
4831	WA 10701-99	2	44.3	92.3	72	80.6	0.3	1.6	1	11.2	4.59	44.9	113	74.8	168	226	1.47	3.6	5.95	52	5

Table 7

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity	Turbidity	pH	Quality Score	Overall Rank
4832	WA 7330-00	2	42.7	95.3	66	77.9	0.8	n.d.	3	11.1	3.26	31.6	103	48.2	160	117	1.56	36.0	6.05	31	23
4833	WA 15279-00	2	46.4	94.2	70	78.3	0.5	1.9	2	10.5	3.34	32.7	76	45.2	222	120	1.58	18.6	6.07	27	29
4834	WA 10429-00	2	44.9	93.0	64	79.5	0.7	n.d.	3	11.5	4.58	42.5	105	69.4	315	206	1.59	29.0	5.93	50	8
4835	99NZ102	6	42.8	90.7	66	77.3	0.4	2.4	2	11.6	4.41	38.8	107	67.4	255	194	1.57	15.7	6.05	28	26
4836	01NZ392	6	41.4	95.5	62	78.7	0.7	2.3	1	12.0	4.46	39.0	104	67.9	311	204	1.56	11.6	5.97	36	21
4837	01NZ706	6	41.8	89.6	72	77.4	0.7	1.4	1	11.2	4.11	37.9	141	62.4	135	173	1.49	5.1	6.09	34	22
4825	MOREX MALT CHECK	6	35.5	87.3	76	80.0	0.4	2.2	1	12.1	5.83	50.7	136	77.6	94	296	1.46	5.0	5.84	53	
Minima			36.4	89.6	53	74.8	0.2	1.3		9.8	2.72	28.2	58	34.7	31	110	1.44	2.5	5.83	15	
Maxima			51.1	98.0	80	81.5	2.2	2.4		13.8	5.35	46.2	166	92.2	719	287	1.61	39.0	6.16	65	
Means			44.6	95.3	67	78.7	0.9	1.8		11.6	4.02	36.8	114	60.0	275	182	1.52	14.2	5.97	39	
Standard Deviations			3.3	2.2	6	1.7	0.5	0.3		0.9	0.66	5.6	23	15.3	150	50	0.04	13.0	0.08	13	
Coefficients of Variation			7.4	2.3	9	2.1	54.1	17.6		7.4	16.35	15.1	20	25.5	55	28	2.76	92.0	1.38	33	

Malt Check Data are Excluded from Rank Sorting and Statistics
Table Data Flagged by an Asterisk Exceed the Mean by +/- 3 Standard Deviations and are Excluded from Statistics
For Wort Clarity - 1 = clear, 2 = slightly hazy, 3 = hazy; Wort Colors were not determined (n.d.) on hazy samples

Samples Submitted by D. B. Cooper, BARI - Ft. Collins

2005 WESTERN REGIONAL SPRING DRYLAND BARLEY NURSERY AND ADDITIONS - POTLATCH, ID

Table 8

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity (relative)	Turbidity (NTU)	pH	Quality Score	Overall Rank
5800	Steptoe	6	36.3	66.5	78	71.3	3.3	n.d.	3	11.9	3.44	29.7	50	31.1	729	85	1.87	33.0	*6.28	15	27
5801	Baronesse	2	37.5	66.9	83	74.5	2.4	n.d.	3	13.4	4.06	30.3	94	39.0	387	110	1.60	24.0	6.10	12	29
5802	Morex	6	31.9	51.8	80	77.6	1.2	1.3	1	12.8	4.91	39.7	152	52.2	250	166	1.55	3.6	6.03	33	10
5803	Harrington	2	36.1	64.8	80	77.7	1.4	1.3	1	14.0	5.30	39.6	127	67.4	307	185	1.53	2.4	6.02	23	19
5804	Legacy(6B93-2978)	6	30.6	43.8	88	76.9	0.7	1.4	1	13.3	5.51	43.5	190	68.4	227	209	1.50	2.6	5.99	42	8
5805	Conlon	2	44.2	97.7	71	78.5	0.8	1.3	1	12.8	4.65	37.2	132	56.2	393	153	1.58	4.4	5.96	47	2
5806	2B99-2039	2	34.4	58.3	81	78.7	0.8	1.7	1	14.3	6.06	43.6	146	85.4	141	249	1.47	2.4	5.95	28	14
5807	2B99-2316	2	35.4	60.2	78	78.0	1.2	1.4	1	13.9	5.33	39.4	157	76.1	191	204	1.48	3.0	5.98	27	16
5808	2B99-2657	2	35.3	64.9	85	79.5	1.1	1.5	1	12.7	5.29	42.7	151	83.1	163	200	1.50	2.9	6.00	45	6
5809	2B99-2771-1	2	35.1	63.6	82	78.4	1.7	1.3	1	13.4	4.94	37.6	131	73.4	366	187	1.59	2.9	5.99	32	12
5810	2B99-2763-10	2	35.7	69.6	83	77.7	0.6	1.5	1	13.3	5.35	41.0	178	74.8	264	201	1.52	3.3	5.96	28	14
5811	94Ab13449	6	33.8	69.6	81	79.4	0.9	n.d.	3	11.6	4.80	43.1	137	54.7	161	186	1.58	24.0	6.00	47	2
5812	98Ab11720	2	36.5	51.6	95	76.5	2.6	1.2	1	11.8	3.95	35.5	79	36.0	415	119	1.56	7.0	6.12	16	26
5813	98Ab11993	2	35.9	69.5	82	76.7	1.4	1.3	1	13.7	4.97	38.2	127	69.0	222	182	1.54	3.1	6.08	23	19
5814	98BX 27-132	2	45.4	96.4	65	76.5	3.3	1.3	1	12.6	3.92	31.5	54	38.4	544	131	1.77	3.1	6.08	26	17
5815	98BX28-44B	2	44.3	96.0	69	76.5	3.8	1.1	1	13.1	3.89	30.0	61	37.0	619	129	1.77	4.4	6.10	21	22
5816	98BX28-58B	2	45.8	96.6	63	76.2	2.8	1.2	1	13.1	4.13	31.8	56	35.5	608	132	1.80	5.4	6.08	24	18
5817	01ST1587	2	40.7	86.7	83	75.4	1.7	2.0	2	12.3	4.27	36.1	102	43.7	316	132	1.60	22.0	6.06	29	13
5818	01ST1758	2	37.7	69.9	86	75.3	2.2	2.0	2	13.3	4.17	32.2	112	42.7	276	123	1.55	12.2	6.06	17	25
5819	MT000047	2	38.9	75.0	82	78.8	1.3	1.4	1	12.8	5.37	42.3	162	71.8	230	271	1.50	2.5	5.99	44	7
5820	MT000125	2	42.3	82.5	76	78.6	1.8	1.2	1	12.9	4.91	38.2	153	67.9	306	232	1.54	2.6	6.00	42	8
5821	MT000138	2	46.8	96.7	73	79.4	1.7	1.8	1	13.6	5.67	41.9	142	61.2	468	292	1.58	4.0	5.84	33	10
5822	Stellar (ND16301)	6	35.1	78.2	84	79.1	1.0	1.5	1	12.2	4.94	42.7	169	57.0	73	188	1.51	4.9	6.00	59	1
5823	ND19854	2	44.5	96.2	72	79.3	0.7	1.7	2	12.4	4.72	38.6	141	53.7	309	139	1.58	11.1	5.91	46	4
5824	ND21863	2	47.1	95.7	77	79.5	1.1	1.2	1	12.0	4.35	36.7	125	45.8	191	157	1.57	3.2	5.90	46	4
5826	PB1-97-2R-7010	2	40.6	76.5	78	74.8	3.1	1.2	1	14.6	4.05	28.0	122	37.3	610	100	1.68	4.4	6.02	20	23
5827	UT97B1480-1632	6	28.4	32.6	74	71.3	5.2	1.3	1	14.7	4.22	29.5	101	34.0	541	128	1.68	6.3	6.07	4	30
5828	UT99B1669-3243	6	32.2	45.3	79	71.0	3.3	n.d.	3	13.2	3.93	29.9	109	34.4	604	126	1.72	31.0	6.14	15	27
5829	Conrad	2	34.2	56.5	78	76.4	1.8	1.3	1	14.4	5.34	37.2	166	76.3	235	169	1.50	2.9	5.94	23	19
5830	Merit	2	31.2	28.6	86	75.3	2.5	1.6	1	15.8	5.84	37.7	209	86.6	224	191	1.48	3.2	5.96	19	24

Table 8

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity (relative)	Turbidity (NTU)	pH	Quality Score
5825	HARRINGTON MALT CHECK	2	37.9	84.3	80	81.7	1.2	1.6	1	12.9	6.00	48.2	131	81.9	122	209	1.47	2.8	5.89	39
Minima			28.4	28.6	63	71.0	0.6	1.1		11.6	3.44	28.0	50	31.1	73	85	1.47	2.4	5.84	4
Maxima			47.1	97.7	95	79.5	5.2	2.0		15.8	6.06	43.6	209	86.6	729	292	1.87	33.0	6.14	59
Means			37.8	70.3	79	76.8	1.9	1.4		13.2	4.74	36.9	128	56.3	346	169	1.59	8.1	6.02	30
Standard Deviations			5.2	19.6	7	2.4	1.1	0.2		1.0	0.68	4.9	40	17.6	172	50	0.11	9.0	0.08	13
Coefficients of Variation			13.8	27.8	9	3.2	57.4	16.9		7.3	14.30	13.3	32	31.3	50	30	6.61	111.8	1.41	44

Malt Check Data are Excluded from Rank Sorting and Statistics

Table Data Flagged by an Asterisk Exceed the Mean by +/- 3 Standard Deviations and are Excluded from Statistics

For Wort Clarity - 1 = clear, 2 = slightly hazy, 3 = hazy; Wort Colors were not determined (n.d.) on hazy samples

Samples Submitted by D. Obert, USDA/ARS - Aberdeen, ID

2005 WESTERN REGIONAL SPRING DRYLAND BARLEY NURSERY AND ADDITIONS - SODA SPRINGS, ID

Table 9

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity (relative)	Turbidity (NTU)	pH	Quality Score	Overall Rank
5903	Steptoe	6	39.3	91.9	81	75.1	3.3	n.d.	3	9.7	3.39	36.3	55	35.5	666	93	1.81	60.0	6.12	19	25
5904	Baronesse	2	35.2	85.2	84	78.3	2.0	n.d.	3	10.4	3.92	39.1	86	47.4	186	119	1.53	50.0	6.01	19	25
5905	Morex	6	33.3	77.7	80	78.4	1.3	2.0	2	11.9	4.58	39.8	139	58.0	156	148	1.51	17.8	5.99	40	11
5906	Harrington	6	35.7	89.9	77	80.0	1.6	1.5	1	12.2	5.11	45.3	140	79.4	187	177	1.49	3.7	5.91	54	1
5907	Legacy(6B93-2978)	2	33.0	81.8	79	79.3	1.1	1.9	1	10.7	4.96	48.1	140	74.9	158	211	1.50	4.7	5.91	32	18
5908	Conlon	2	41.2	98.0	76	79.5	0.9	1.9	1	11.5	4.66	44.0	115	74.7	250	156	1.50	7.6	5.84	51	3
5909	2B99-2039	2	37.9	95.3	77	81.4	0.6	2.0	1	11.4	5.42	50.8	117	89.7	103	234	1.45	4.1	5.88	48	6
5910	2B99-2316	2	36.5	84.9	77	80.9	1.1	2.2	1	10.9	4.89	47.9	119	87.9	168	253	1.47	6.6	5.90	32	18
5911	2B99-2657	2	36.0	90.7	80	81.4	0.5	1.8	1	11.0	5.10	49.0	123	100.3	123	258	1.47	4.3	5.93	51	3
5912	2B99-2771-1	2	34.7	79.0	79	79.9	2.0	1.7	1	10.9	4.53	44.3	92	72.9	298	197	1.58	5.7	5.88	33	17
5913	2B99-2763-10	2	37.9	93.8	81	80.2	0.7	2.5	1	10.6	5.18	51.3	123	87.7	149	223	1.48	10.4	5.80	43	8
5914	94Ab13449	6	33.8	86.8	78	80.7	1.3	3.3	2	10.1	5.06	54.2	83	64.8	185	222	1.54	14.1	5.68	36	16
5915	98Ab11720	2	36.8	89.1	87	78.9	3.0	n.d.	3	9.2	3.53	39.1	65	39.4	428	114	1.68	32.0	6.04	16	30
5916	98Ab11993	2	40.3	97.4	75	81.4	0.9	1.8	1	10.1	4.52	48.1	98	75.9	156	212	1.54	9.2	5.92	40	11
5918	98BX 27-132	2	39.4	93.6	70	75.8	*5.1	n.d.	3	11.1	3.56	33.1	52	34.3	653	99	1.84	22.0	6.00	17	29
5919	98BX28-44B	2	42.6	96.9	66	77.2	3.4	1.4	1	12.1	3.96	33.3	70	39.7	599	141	1.67	6.2	5.96	26	21
5920	98BX28-58B	2	44.8	97.9	67	75.7	3.6	1.6	2	12.3	3.71	31.2	65	35.9	697	149	1.85	11.5	5.98	25	23
5921	01ST1587	2	38.8	95.8	75	78.3	1.6	n.d.	3	10.1	3.66	38.4	90	45.6	211	136	1.54	52.0	6.03	23	24
5922	01ST1758	2	38.0	94.5	77	78.7	1.6	n.d.	3	9.8	3.72	40.3	82	40.8	246	142	1.54	54.0	5.99	18	28
5923	MT000047	2	37.1	90.6	82	80.9	1.6	2.0	1	10.6	4.98	49.8	115	79.5	306	229	1.53	5.2	5.90	37	15
5924	MT000125	2	40.4	93.5	77	80.2	2.0	2.0	1	11.4	4.84	43.3	113	74.9	432	224	1.58	5.4	5.86	51	3
5925	MT000138	2	40.2	92.4	76	82.2	1.6	2.4	1	10.8	5.30	53.4	96	74.3	364	234	1.51	6.1	5.75	40	11
5926	Stellar (ND16301)	6	33.6	87.3	86	79.0	1.2	1.9	1	11.0	4.88	46.2	132	63.3	117	200	1.50	9.4	5.86	53	2
5927	ND19854	2	40.1	97.1	71	79.2	2.1	1.9	1	11.3	4.38	41.1	119	60.1	430	169	1.59	10.6	5.85	39	14
5928	ND21863	2	42.0	96.3	79	80.3	1.0	1.7	1	10.6	4.39	44.4	102	55.4	166	158	1.48	6.0	5.85	42	9
5929	PB1-97-2R-7010	2	40.2	96.2	67	77.2	1.9	2.3	2	11.8	4.26	37.7	95	47.1	513	148	1.59	16.6	5.98	30	20
5930	UT97B1480-1632	6	36.6	92.0	69	74.9	3.0	1.7	1	11.8	3.67	32.4	76	35.1	617	108	1.70	12.1	6.08	26	21
5931	UT99B1669-3243	6	39.1	95.4	70	75.8	2.3	n.d.	3	10.8	3.81	37.2	83	41.1	583	131	1.70	57.0	5.99	19	25
5932	Conrad	2	37.2	91.5	76	79.4	2.1	1.5	1	11.3	4.90	46.0	120	79.7	232	214	1.48	3.3	5.85	47	7
5933	Merit	2	35.0	87.2	79	81.7	0.9	1.9	1	9.8	4.68	52.3	117	108.0	137	213	1.48	5.7	5.95	41	10

Table 9

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity (relative)	Turbidity (NTU)	pH	Quality Score
5917	MOREX MALT CHECK	6	34.4	85.8	78	80.2	0.6	2.2	1	12.4	6.21	53.4	129	73.1	117	320	1.50	5.5	5.83	50
Minima			33.0	77.7	66	74.9	0.5	1.4		9.2	3.39	31.2	52	34.3	103	93	1.45	3.3	5.68	16
Maxima			44.8	98.0	87	82.2	3.6	4.9		12.3	5.42	54.2	140	108.0	697	258	1.85	60.0	6.12	54
Means			37.9	91.3	77	79.1	1.7	2.4		10.9	4.45	43.3	101	63.4	317	177	1.57	17.1	5.92	35
Standard Deviations			2.9	5.5	5	2.1	0.9	1.1		0.8	0.61	6.6	25	21.2	193	49	0.11	18.2	0.10	12
Coefficients of Variation			7.8	6.1	7	2.6	50.4	43.8		7.3	13.76	15.2	25	33.4	61	28	7.19	106.2	1.61	34

Malt Check Data are Excluded from Rank Sorting and Statistics
Table Data Flagged by an Asterisk Exceed the Mean by +/- 3 Standard Deviations and are Excluded from Statistics
For Wort Clarity - 1 = clear, 2 = slightly hazy, 3 = hazy; Wort Colors were not determined (n.d.) on hazy samples

Samples Submitted by D. Obert, USDA/ARS - Aberdeen, ID

2005 WESTERN REGIONAL SPRING DRYLAND BARLEY NURSERY AND ADDITIONS - TETONIA, ID
Table 10

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity (relative)	Turbidity (NTU)	pH	Quality Score	Overall Rank
5872	Steptoe	6	31.3	68.9	87	72.5	3.0	n.d.	3	13.5	3.67	28.5	64	33.1	836	91	2.00	36.0	6.15	14	24
5873	Baronesse	2	31.0	65.9	80	72.7	3.0	n.d.	3	17.2	4.19	24.4	131	46.1	471	148	1.56	26.0	6.06	17	19
5874	Morex	6	25.6	36.6	81	75.6	2.8	1.5	1	17.2	5.38	31.5	229	72.2	206	170	1.48	5.7	6.00	23	6
5875	Harrington	6	32.5	71.0	73	77.0	2.8	1.4	1	16.7	5.33	32.9	188	77.4	354	146	1.52	4.2	5.99	28	1
5876	Legacy(6B93-2978)	2	25.7	41.2	89	74.7	3.4	1.5	1	16.9	5.47	33.7	234	77.3	218	152	1.47	4.9	5.99	23	6
5877	Conlon	2	37.0	85.2	76	76.2	2.3	1.6	1	16.3	4.96	31.5	154	59.3	463	138	1.59	7.5	5.92	26	2
5878	2B99-2039	2	30.8	64.6	73	78.5	2.0	2.9	1	17.0	6.76	40.0	176	93.5	151	207	1.44	7.5	5.85	20	11
5879	2B99-2316	2	31.7	64.6	73	77.8	2.0	1.6	1	16.3	5.91	36.4	198	95.5	249	199	1.45	4.8	5.95	19	12
5880	2B99-2657	2	31.6	66.0	76	77.7	2.4	2.0	1	17.2	5.81	35.3	181	96.7	325	232	1.49	8.0	5.96	19	12
5881	2B99-2771-1	2	32.2	63.3	78	76.1	3.7	1.6	1	16.5	5.59	35.4	159	80.0	405	173	1.51	4.8	5.92	23	6
5882	2B99-2763-10	2	31.2	65.5	75	76.7	2.2	1.5	1	16.6	5.63	35.2	206	90.2	264	149	1.47	5.2	5.96	19	12
5883	94Ab13449	6	28.7	55.0	80	77.6	1.0	n.d.	3	13.8	5.02	37.5	156	58.0	189	184	1.57	35.0	5.98	24	5
5884	98Ab11720	2	31.6	50.6	88	72.7	5.2	n.d.	3	16.6	3.89	24.0	126	36.4	649	101	1.75	22.0	6.06	11	29
5885	98Ab11993	2	31.9	66.9	76	75.2	2.8	1.5	1	16.3	4.98	31.2	153	78.1	347	162	1.59	4.2	6.06	23	6
5886	98BX 27-132	2	35.5	69.9	63	69.3	7.0	1.6	2	19.6	4.21	21.7	111	37.0	748	125	1.93	10.0	6.00	12	28
5887	98BX28-44B	2	37.9	87.6	65	72.2	6.0	1.4	2	18.1	4.13	23.4	100	40.4	728	122	1.88	10.4	5.99	15	23
5888	98BX28-58B	2	38.5	82.2	62	70.5	5.5	1.6	2	19.8	4.24	21.7	115	37.8	832	115	2.03	12.2	5.98	14	24
5889	01ST1587	2	33.9	67.5	81	72.0	2.8	n.d.	3	17.0	4.34	25.6	147	48.5	326	117	1.57	12.6	6.03	17	19
5890	01ST1758	2	32.6	67.7	81	73.2	3.9	n.d.	3	17.1	4.09	24.5	124	43.9	536	114	1.70	38.0	6.05	14	24
5892	MT000047	2	32.1	58.4	79	76.5	2.6	1.6	1	16.6	5.75	35.5	184	74.9	388	199	1.56	3.5	5.90	19	12
5893	MT000125	2	35.9	67.4	76	76.9	3.2	1.5	1	16.1	5.45	34.0	213	77.0	384	183	1.57	3.7	5.90	23	6
5894	MT000138	2	36.9	70.6	72	76.9	2.0	1.8	1	17.3	6.17	35.8	194	73.7	413	214	1.57	4.8	5.87	16	21
5895	Stellar (ND16301)	6	26.7	47.9	91	75.3	1.3	1.8	2	16.0	5.27	34.1	250	64.8	159	168	1.52	12.3	5.98	25	3
5896	ND19854	2	34.2	70.5	74	78.6	1.8	n.d.	3	14.6	4.63	32.2	171	59.7	423	134	1.66	38.0	5.94	25	3
5897	ND21863	2	37.2	74.4	78	77.2	2.5	1.2	1	15.2	4.39	29.3	149	48.0	458	125	1.66	5.2	5.95	19	12
5898	PB1-97-2R-7010	2	37.2	79.1	67	74.9	3.1	1.3	1	16.4	4.18	26.1	150	44.2	590	112	1.68	6.9	6.05	16	21
5899	UT97B1480-1632	6	29.6	54.2	77	72.4	4.4	1.4	1	16.1	4.27	26.8	114	38.4	682	116	1.79	8.4	6.09	8	30
5900	UT99B1669-3243	6	29.2	49.3	82	71.4	3.3	n.d.	3	15.7	4.22	28.0	140	39.0	702	106	1.76	52.0	6.12	13	27
5901	Conrad	2	32.9	64.0	66	75.7	2.6	1.6	1	17.8	5.79	32.8	234	89.9	307	195	1.52	6.6	5.90	19	12
5902	Merit	2	32.4	61.8	73	76.8	2.5	1.5	1	17.3	5.70	33.3	239	101.6	327	192	1.53	4.4	5.99	19	12

Table 10

Lab No.	Variety or Selection	Rowed	Kernel Weight (mg)	on 6/64" (%)	Barley Color (Agtron)	Malt Extract (%)	F - C	Wort Color	Wort Clarity	Barley Protein (%)	Wort Protein (%)	S/T (%)	DP (°ASBC)	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)	Viscosity (relative)	Turbidity (NTU)	pH	Quality Score
5891	MOREX MALT CHECK	6	34.9	85.7	84	80.4	0.5	2.0	1	12.7	6.29	53.1	124	72.2	73	252	1.48	3.8	5.85	50
Minima			25.6	36.6	62	69.3	1.0	1.2		13.5	3.67	21.7	64	33.1	151	91	1.44	3.5	5.85	8
Maxima			38.5	87.6	91	78.6	7.0	3.7		19.8	6.76	40.0	250	101.6	836	232	2.03	52.0	6.15	28
Means			32.5	64.6	76	75.0	3.1	1.9		16.6	4.98	30.8	166	63.8	438	153	1.63	13.5	5.99	19
Standard Deviations			3.5	11.8	7	2.5	1.4	0.6		1.3	0.79	5.1	46	21.7	201	38	0.16	13.2	0.07	5
Coefficients of Variation			10.6	18.3	10	3.4	43.6	33.2		7.9	15.94	16.5	28	34.0	46	25	9.96	98.1	1.21	26

Malt Check Data are Excluded from Rank Sorting and Statistics
Table Data Flagged by an Asterisk Exceed the Mean by +/- 3 Standard Deviations and are Excluded from Statistics
For Wort Clarity - 1 = clear, 2 = slightly hazy, 3 = hazy; Wort Colors were not determined (n.d.) on hazy samples

Samples Submitted by D. Obert, USDA/ARS - Aberdeen, ID

Appendix A: METHODS

Cleaning All samples were cleaned on a Carter Dockage Tester and any material not retained on a 5/64" screen was discarded.

Barley Mill Ground barley was prepared with a Labconco Burr mill that was adjusted so that only 35% of the grist remained on a 525 µm sieve after 3 min of shaking and tapping.

Kernel Weight The number of kernels in a 20 g aliquot of each sample was counted electronically and the '1000 kernel weight' was calculated.

Plumpness Samples were sized on a Eureka-Niagra Barley Grader and the percentage of the seeds retained on a 6/64" screen was determined.

Barley Color The brightness of the grains was measured using an Agtron M45-D analyzer.

Barley Moisture Content (Barley 5B) Five g of ground sample was dried for 3 h at 104°C. The percentage of weight loss that occurred during this drying was calculated.

Barley Protein Content Total nitrogen values were obtained using an automated Dumas combustion procedure with a LECO FP-528 analyzer. Nitrogen values were converted to protein percentages by multiplication by 6.25.

Malting Conditions 170 g (db) barley samples were steeped at 16°C for 32-48 h, to 45% moisture, by alternating 4 h of wet steep with 4 h of air rest. The steeped samples were placed in a chamber for 5 d at 17°C and near 100% R.H., in cans that were rotated for 3.0 min every 30 min. The germinated grain (green malt) was kilned for 24 h as follows: 0.5 h from 25°C to 49°C, 9.5 h at 49°C, 0.5 h from 49°C to 54°C, 4.0 h at 54°C, 0.5 h from 54°C to 60°C, 3.0 h at 60°C, 0.5 h from 60°C to 68°C, 2.0 h at 68°C, 0.5h from 68°C to 85°C, and 3.0 h at 85°C.

Malt Mill Fine-grind malts were prepared with a Miag laboratory cone mill that was adjusted so that 10% of the grist remained on a 525 µm sieve after 3 min of shaking, with tapping. Coarse-grind malts were prepared with a corrugated roller mill that was adjusted so that 75% of the grist remained on a 525 µm sieve. Malts to be used for moisture, protein and amylolytic activity analyses were ground in a Labconco Burr mill (see Barley Mill).

Malt Moisture Content Determined by Malt 3 (Methods of Analysis of the ASBC, 8th ed, 1992) See Barley Moisture Content.

Malt Protein Content See Barley Protein Content.

Malt Extract Samples were extracted using the Malt-4 procedure (Methods of Analysis of the ASBC, 8th ed, 1992), except that all weights and volumes specified for the method were halved. The specific gravity of the filtrate was measured with an Anton/Parr DMA5000 density meter. The density data were used to calculate the amount of soluble material present in the filtrate, and thus the percentage that was extracted from the malt. **F-C** represents the difference in extract % between the finely ground malts and the coarsely ground malts.

Wort Color was determined on a Skalar SAN plus analyzer by measuring the absorbance at 430nm and dividing by a factor determined by collaborative testing.

Wort Clarity was assessed by visual inspection.

β-Glucan Levels were determined on a Skalar SAN plus analyzer by using the Wort-18 fluorescence flow injection analysis method with calcofluor as the fluorescent agent (Methods of Analysis of the ASBC, 8th ed, 1992).

Free Amino Nitrogen Levels were determined on a Skalar SAN plus analyzer using an automated version of the Wort-12 protocol (Methods of Analysis of the ASBC, 8th ed, 1992).

Soluble (Wort) Protein Levels were determined on a Skalar SAN plus analyzer using the Wort-17 UV-spectrophotometric method (Methods of Analysis of the ASBC, 8th ed, 1992).

S/T Ratio was calculated as Soluble Protein / Total Malt Protein

Diastatic Power Values were determined on a Skalar SAN plus analyzer by the automated ferricyanide procedure Malt-6A (Methods of Analysis of the ASBC, 8th ed, 1992).

α-Amylase activities were measured on a Skalar SAN plus analyzer by heating the extract to 73°C to inactivate any β-amylase present. The remaining (α-amylase) activity was measured as described for Diastatic Power Values.

Turbidities were determined in Nephelometric Turbidity Units (NTU) on a Hach Model 18900 Ratio Turbidimeter.

Quality Scores were calculated by using a modification of the method of Clancy and Ullrich (Cereal Chem. 65:428-430, 1988). The criteria used to quantify individual quality factors are listed in Table A1.

Overall Rank Values were ordered from low to high based on their Quality Scores. A rank of '1' was assigned to the sample with the best quality score.

Appendix B 2005 Crop Year

Quality Score Parameters for 2- and 6-rowed barleys

	2-rowed		6-rowed	
Quality parameter	condition	score	condition	score
Kernel Weight	> 42.0	5	> 32.0	5
(mg)	40.1–42.0	4	30.1–32.0	4
	38.1–40.0	2	28.1–30.0	2
	≤ 38.0	0	≤ 28.0	0
on 6/64 "	≥ 90.0	5	≥ 80.0	5
(%)	85.0–89.9	3	73.0–79.9	3
	< 85.0	0	< 73.0	0
Malt Extract	≥ 81.0	10	≥ 79.0	10
(% db)	79.4–81.0	7	78.2–78.9	7
	78.0–79.4	4	77.7–78.2	4
	<78.0	0	< 77.7	0
Wort Clarity	= 3	0	= 3	0
3=hazy	= 2	1	= 2	1
2=slightly hazy	= 1	2	= 1	2
1=clear				
Barley Protein	≥ 13.5	0	≥ 14.0	0
(% db)	13.0–13.5	5	13.5–13.9	5
	11.0–13.0	10	11.5–13.5	10
	≤ 11.0	5	≤ 11.5	5
Wort Protein	> 6.0	0	> 6.0	0
(% db)	5.6–6.0	3	5.7–6.0	3
	4.4–5.6	7	5.2–5.7	7
	4.0–4.4	3	4.8–5.2	3
	< 4.0	0	< 4.8	0
S/T (Soluble/Total	>47	0	>47	0
Protein, % db)	40–47	5	42–47	5
	< 40	0	< 42	0
DP (Diastatic	>120	7	>140	7
Power, ° ASBC)	100–120	4	120–140	4
	< 100	0	< 120	0
Alpha-amylase	>45	7	>45	7
(20° DU)	40–45	4	40–45	4
	< 40	0	< 40	0
Beta-glucan	< 100	7	<120	7
(ppm)	100–150	3	120 – 170	3
	> 150	0	> 170	0