Malting Barley Variety Trial
2015 Results

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Twenty varieties of two- and six-row spring malting barley were trialed at University of Maine research farms in Old Town and Presque Isle in 2015 (Table 1). The trials were conducted in collaboration with nine other institutions from Indiana to Prince Edward Island as part of the Eastern US Spring Malting Barley Evaluation project, organized by North Dakota State University.

Table 1. Spring malting varieties evaluated in Old Town and Presque Isle, Maine in 2015.

Variety	Type	Developer
AAC Synergy	2-row	Agriculture and Agri-Food Canada (Brandon)
AC Metcalfe	2-row	Agriculture and Agri-Food Canada (Brandon)
Bentley	2-row	FCDC† (Lacombe, Alberta, Canada)
CDC Copeland	2-row	CDC‡ (University of Saskatchewan)
CDC Meredith	2-row	CDC‡ (University of Saskatchewan)
Cerveza	2-row	Agriculture and Agri-Food Canada (Brandon)
Conlon	2-row	North Dakota State University
Full Pint	2-row	Oregon State University
Harrington	2-row	North Dakota State University
Innovation	6-row	Busch Agricultural Resources, LLC
Klages	2-row	USDA-ARS Aberdeen, ID
Lacey	6-row	University of Minnesota
ND Genesis	2-row	North Dakota State University
ND22421	6-row	North Dakota State University
Newdale	2-row	Agriculture and Agri-Food Canada (Brandon)
Pinnacle	2-row	North Dakota State University
Quest	6-row	University of Minnesota
Robust	6-row	University of Minnesota
Scarlett	2-row	Saatzucht Josef Breun GmbH & Co
Tradition	6-row	Busch Agricultural Resources, LLC

† Field Crop Development Center
‡ Crop Development Centre

METHODS

University of Maine Rogers Farm – Old Town, ME – The previous crop was buckwheat, and the soil was a Melrose fine sandy loam, with pH 6.2, and medium phosphorus and above optimum potassium levels. Solid dairy manure was applied on April 30 at a rate of 20 tons/acre and immediately incorporated. The field was prepared with a seedbed conditioner and planted at 1.3 million live seeds/acre on May 1 with a cone seeder (6.5 inch row spacing). Plots were tine harrowed on May 22 when the barley plants had approximately three to four leaves; and were harvested on August 6 with a plot combine.

University of Maine Aroostook Farm – Presque Isle, ME – The previous crop was potato and the soil was a Caribou gravely loam. Soil pH was 5.6. Potassium and phosphorus levels were optimum. Plots were chisel plowed on May 18, seedbed conditioned on May 21, and planted at 1.3 million live seeds/acre on May 21 with a small plot cone seeder (6.5-inch row spacing). Ammonium nitrate was applied on June 10 at 60 lb/acre of nitrogen. A combination of herbicides, MCPA Rhomene at ¾ pint/acre and Harmony at 1 oz/acre, were applied on June 26. Plots were harvested on September 2 with a plot combine.

RESULTS

Grain yields were relatively high at both sites, averaging 96 bu/acre in Old Town and 91 bu/acre in Presque Isle (Table 2). For comparison, the statewide average barley yield in 2015 was 85 bu/acre, and the 15-year average is 59 bu/acre (National Agriculture Statistics Service). The highest yielding varieties were ND22421, Quest, AAC Synergy and Robust. Scarlett and Harrington were the lowest yielding and also the most susceptible to leaf diseases. The primary leaf diseases found at both sites were leaf rust, net blotch and some powdery mildew. Other variety characteristics reported in Table 2 include heading date, spike density, stem height, stem breakage, and grain moisture at harvest.

Grain quality measures are reported in Table 3. The grain from both sites tested low for the mycotoxin deoxinivalenol (DON), which is produced by the Fusarium head blight fungus. Finished grain products with DON levels exceeding 1 ppm are considered unsafe for human consumption (US Food and Drug Administration). DON reached 1 ppm in only one case. Pre-harvest sprouting (PHS) was an issue at the Presque Isle site, due to delayed harvest. PHS reduces malting quality by reducing grain germination ability. PHS damage was assessed with a Rapid Visco-Analyzer (RVA), which reports “stirring numbers”. RVA stirring numbers below 120 indicate PHS damage. The average stirring number at the Presque Isle site was 36. However, Tradition, Robust and Quest, all 6-row varieties, demonstrated PHS resistance with stirring numbers above 120. In Old Town, where harvest was timely, all but seven varieties tested above 120. Grain protein levels at both sites were relatively low, likely due to high yields. The generally acceptable protein range for malting barley is 9.5 to 12.5% (dry matter basis). Kernel plumpness was good to excellent across varieties and sites with Harrington being the one exception. Grain from the Old Town site was suitable for malting. Malt quality results from this site are reported in Table 4.

Updated July 2016

Table 2. Agronomic characteristics of malting barley varieties grown in Old Town and Presque in 2015.

	Yield† (bu/acre)		Grain Moisture at Harvest‡ (%)		Foliar Disease Severity (1 - 9) §		Height (in)		Stem Breakage (1-9) #		Spike Density (num/ft^2)		Heading date Days after 5/31	
Variety	Old Town	Presque Isle	Old Town	Presque Isle	Old Town	Presque Isle	Old Town	Presque Isle	Old Town	Presque Isle	Old Town	Presque Isle	Old Town	Presque Isle
AAC Synergy	**104**	**106**	16.3	14.0	5.3	3.7	30.2	25.5	1.3	1.0	71	68	25	47
AC Metcalfe	95	93	15.0	**14.3**	4.8	5.5	**33.7**	23.5	**3.0**	1.0	**86**	59	26	55
Bentley	**100**	91	16.3	14.0	4.5	4.5	32.4	24.7	**3.3**	1.3	51	61	25	48
CDC Copeland	98	89	15.0	**14.7**	5.0	5.0	32.2	25.9	**3.3**	2.3	**83**	61	31	48
CDC Meredith	**100**	99	16.0	**14.3**	4.2	3.5	30.8	24.4	**3.3**	1.7	**77**	**81**	30	46
Cerveza	**101**	98	14.7	14.0	3.8	3.3	30.6	22.8	1.7	1.7	**79**	62	26	47
Conlon	89	75	16.0	14.0	5.0	6.3	29.0	23.8	2.0	2.0	57	**74**	19	38
Full Pint	80	78	16.0	14.0	5.0	5.8	19.6	15.3	1.3	1.3	**81**	**84**	31	51
Harrington	69	64	15.3	14.0	**8.2**	**8.7**	**35.8**	**27.3**	**4.0**	3.0	**91**	63	28	55
Innovation	**106**	100	**19.0**	13.0	5.0	4.8	29.8	25.1	1.0	1.7	36	43	20	39
Klages	92	98	17.0	**14.7**	4.5	5.2	32.4	25.1	2.7	1.3	**96**	**77**	31	54
Lacey	**109**	100	**19.3**	14.0	5.0	5.3	**32.7**	24.8	1.3	1.3	44	39	20	41
ND Genesis	94	86	18.3	14.0	4.7	6.3	28.5	24.6	1.0	1.0	62	67	21	43
ND22421	**114**	**118**	**20.3**	13.7	4.5	5.3	29.2	24.1	1.0	1.0	48	35	21	41
Newdale	**105**	82	15.7	14.0	5.5	4.3	27.7	21.4	1.7	1.0	59	**73**	26	51
Pinnacle	86	84	18.3	**14.3**	**7.7**	**7.3**	32.1	24.8	2.7	2.3	75	58	21	44
Quest	**101**	**103**	18.7	14.0	4.0	3.7	**35.6**	**29.1**	1.7	2.7	55	48	21	42
Robust	**105**	**103**	18.7	14.0	4.2	3.5	**34.4**	**29.0**	1.7	2.0	39	41	21	43
Scarlett	74	58	16.3	14.0	**6.8**	**8.0**	27.2	22.6	2.3	**4.3**	**78**	**75**	31	47
Tradition	93	101	**20.0**	13.7	5.3	5.7	31.4	**27.0**	1.0	1.0	45	37	21	41
Site average	96	91	17.1	14.0	5.2	5.3	30.8	24.5	2.1	1.8	66	60	-	-
LSD (0.05)	16	16	1.4	0.6	2.4	2.3	3.0	2.1	1.2	1.1	19	16	25	46

† Yield at 13.5% moisture.

‡ Measured at time of harvest.

§ Scored visually using a scale from 1 = no disease pressure to 9 = high disease pressure. Scored on June 22 in Old Town and Aug 11 in Presque Isle.

Scored visually using a scale from 1 = no stem breakage to 9 = severe stem breakage.

Table 3. Grain quality characteristics of malting barley varieties grown in Old Town and Presque Isle in 2015.

	Test Wt. (lbs/bu)		TKW† (g)		DON‡ (ppm)		Protein≠ (%)		Plump Kernels§ (%)		Color (L-value)		RVA#		Germ. Energy (%)
Variety	Old Town	Presque Isle	Old Town	Presque Isle	Old Town	Presque Isle	Old Town	Presque Isle	Old Town	Presque Isle	Old Town	Presque Isle	Old Town	Presque Isle	Old Town
AAC Synergy	49	**49**	49.0	50.7	0.1	0.1	8.2	9.8	98	98	50	51	77	3	96
AC Metcalfe	**52**	**50**	46.7	48.7	0.0	0.1	8.7	10.6	95	97	51	51	164	3	96
Bentley	**51**	**49**	50.3	51.7	0.0	0.2	8.7	9.6	98	98	52	51	162	4	96
CDC Copeland	**51**	47	46.3	47.0	0.0	0.1	8.4	9.6	96	98	52	51	114	3	98
CDC Meredith	49	48	47.0	48.3	0.0	0.2	7.9	9.5	95	98	50	50	92	4	96
Cerveza	49	47	46.3	48.3	0.0	0.2	8.5	9.7	94	96	51	51	81	2	96
Conlon	**52**	**50**	**55.0**	**55.7**	0.0	0.0	10.1	11.8	99	99	52	51	104	34	94
Full Pint	50	48	46.7	50.3	0.0	0.2	9.5	11.1	87	98	50	51	149	2	97
Harrington	49	48	38.0	38.0	0.0	0.2	9.7	11.1	62	77	49	50	178	82	100
Innovation	49	**49**	45.3	44.7	0.0	0.3	9.9	11.9	99	98	51	51	162	6	97
Klages	**50**	**50**	44.0	46.7	0.0	0.0	8.8	10.5	85	94	51	51	178	8	99
Lacey	**50**	**49**	44.3	43.7	0.0	0.2	10.3	10.9	98	97	51	50	157	47	97
ND Genesis	50	**50**	51.0	49.7	0.0	0.1	8.7	9.6	89	98	50	51	147	6	93
ND22421	47	**49**	44.7	44.7	0.0	1.0	9.7	11.2	99	98	51	52	106	44	94
Newdale	**51**	47	46.0	46.0	0.0	0.2	8.7	10.1	95	97	51	50	127	4	99
Pinnacle	49	**50**	**53.0**	53.0	0.0	0.0	8.0	9.4	90	98	50	50	165	48	94
Quest	49	**49**	40.0	40.3	0.0	0.1	9.9	11.3	91	93	51	51	176	121	97
Robust	**50**	**50**	43.0	44.0	0.0	0.4	9.9	11.6	96	97	51	50	179	128	98
Scarlett	47	46	39.0	39.3	0.0	0.1	8.4	11.1	91	92	49	50	118	24	98
Tradition	48	**50**	43.0	43.7	0.0	0.1	9.6	11.5	97	98	51	52	159	150	100
Site average	50	49	45.9	46.7	0.0	0.2	9.1	10.6	93	96	51	51	140	36	97
LSD (0.05)	1.8	1.8	2.6	2.5	-	-	-	-	-	-	-	-	-	-	-

† TKW = Thousand kernel weight.

‡ DON = Deoxynivalenol, a mycotoxin caused by Fusarium head blight.

≠ Protein on a dry matter basis. Acceptable range is 9.5% to 12.5%.

§ Kernel plumpness is measured as the percentage of barley kernels that remain on the top of a 6/64" by 3/4" slotted sieve after shaking.

RVA = Rapid Visco-Analyzer, which measures damage from pre-harvest sprouting. A stirring number less than 120 indicates grain with sprout damage. The lower the number the higher the levels of damage from pre-harvest sprouting.

Table 4. Malt quality results for malt made from the barley varieties grown in Old Town in 2015.

Variety	Fine Grind Extract† (%)	Diastatic Power‡ (°L)	Alpha-Amylase≠ (DU)	Soluble Protein§ (%)	Wort Color (ASBC)	FAN# (Mg/L)	Beta-glucan¥ (mg/L)
AAC Synergy	83	43	67	5	3	230	314
AC Metcalfe	82	68	73	5	3	249	285
Bentley	83	52	63	5	3	229	302
CDC Copeland	83	54	67	5	3	241	229
CDC Meredith	82	48	64	5	4	211	193
Cerveza	83	52	69	5	3	198	352
Conlon	82	67	57	5	3	227	574
Full Pint	80	64	76	6	4	228	326
Harrington	79	59	54	5	3	200	372
Innovation	82	96	73	5	2	215	337
Klages	82	64	70	6	3	229	390
Lacey	81	82	68	5	3	207	390
ND Genesis	83	46	58	5	3	206	499
ND22421	81	57	67	5	3	219	507
Newdale	82	61	70	5	3	210	370
Pinnacle	83	44	60	5	3	184	552
Quest	82	79	71	5	2	224	488
Robust	81	110	54	5	2	201	345
Scarlett	82	50	77	6	4	237	200
Tradition	81	88	71	5	2	216	494
Site average	82	64	66	5	3	218	376

† Indicator of the maximum yield of soluble components in the wort (hot water mixed with ground malt). Soluble components are primarily carbohydrates, the source of fermentable sugars, and proteins. Reported as a percentage of original malt weight on a dry matter basis. Minimum acceptable level is 80%.

‡ Indicator of the strength of all starch-degrading enzymes in the malt. Reported in "°Lintner".

≠ Indicator of the strength of the alpha-amylase enzyme. Reported in dextrinizing units (DU). Acceptable levels for an all-malt mash is >30%.

§ The amount of soluble proteins in the wort expressed as a percentage of malt weight. Acceptable range is 4.5-5.5%.

FAN = Free amino nitrogen. A measure of amino acids and small peptides available in the malt to support yeast during fermentation.

¥ The concentration of beta glucan (cell wall material) is associated with lautering issues.