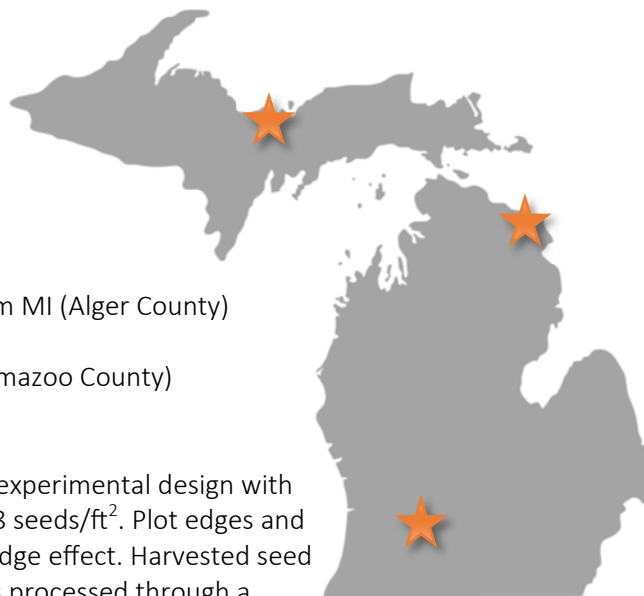


# 2016 Michigan State University Spring Malting Barley Variety Trials

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With support from: MSU AgBioResearch, MSU Extension, the Brewers Association, and Pilarski Farm

This report outlines the data and results from Michigan State University's involvement in the Eastern Spring Barley Nursery (ESBN), organized by the Craft Maltsters Guild and North Dakota State University. This multi-state collaborative effort facilitates simultaneous testing of spring malting barley varieties.



## ESBN Locations

1. MSU Upper Peninsula Research and Extension Center, Chatham MI (Alger County)
2. Pilarski Farm, Posen, MI (Presque Isle County)
3. MSU W.K. Kellogg Biological Station, Hickory Corners, MI (Kalamazoo County)

## Protocol

Twenty-eight barley varieties were laid out in a rectangular lattice experimental design with three replications. All varieties were planted at a seeding rate of 28 seeds/ft<sup>2</sup>. Plot edges and alleys were cut out before harvest for the purpose of eliminating edge effect. Harvested seed was cleaned in an A.T. Ferrell Eclipse fanning mill and the seed was processed through a Dickey-John GAC 2500 for test weight and grain moisture percentage. Yield was corrected for 13% moisture, and test weight was recorded in pounds per bushel. Seed was submitted for grain quality and malt analysis to the testing laboratory at North Dakota State University and USDA ARS Cereal Crops Research laboratory, respectively. Agronomic details and weather information for the plots are outlined in Table 1.

**Table 1.** Plot information and weather data for each trial location

	Chatham (UPREC)	Posen (Pilarski Farm)	Hickory Corners (KBS)
Soil Type	Eben Very cobbly sandy loam	Omena Fine sandy loam	Kalamazoo Loam
Previous Crop	Soybeans	Soybeans	Soybeans
Planting Date	May 3	May 10	April 26
Fertility applied	108 lbs/ac of 46-0-0	108 lbs/ac of 46-0-0	125 lbs/ac of 46-0-0
Herbicide applied	13.5 ozs/ac Huskie	13.5 ozs/ac Huskie	13.5 ozs/ac Huskie
Fungicide applied	8.2 ozs/ac Prosaro	8.2 ozs/ac Prosaro	7 ozs/ac Prosaro
Insecticide applied	NA	NA	3.2 ozs/ac Grizzly Z
Harvest date	August 17	August 10	August 1
Precipitation <sup>1</sup> (average)	8.08 (7.99)	3.89 (8.24)	10.22 (10.7)
GDD <sup>2</sup> (average)	1151.1 (1093)	1358 (1264)	1762.7 (1738)

<sup>1</sup>Precipitation (inches) May through July, with 6-year rainfall average

<sup>2</sup>Growing degree days (Base level 50° since 1/1/16) through July, with 6-year GDD average from 1/1-7/31

## Selecting a variety

The malting barley industry in Michigan is still quite immature, leading to very few readily available varieties within the state. Programs, such as the ESNB, has helped inform researchers at MSU, and has led to varietal recommendations to in-state certified seed growers. Careful consideration must be made when selecting varieties, and one should not purchase a variety simply because “it’s what’s available”. Keep in mind, craft brewers prefer 2-row varieties that have been bred specifically for malting. Maltsters, a barley grower’s direct market, will prefer grain with 10-12% protein that has plump kernels and uniform germination with no evidence of sprout or DON.

*Manage quality over quantity!*

## Seed Sources

[Michigan Crop Improvement Association](http://www.michcrop.com)

[www.michcrop.com](http://www.michcrop.com)

(includes C3 Seeds, Lauwers Farms, & Schmidt Farms of Auburn)

[Limagrains Cereal Seeds](http://www.limagraincerealseeds.com)

[www.limagraincerealseeds.com/products/barley](http://www.limagraincerealseeds.com/products/barley)

[Seedway](http://www.seedway.com)

[www.seedway.com/product-farm-seed/small-grains](http://www.seedway.com/product-farm-seed/small-grains)

[Albert Lea Seed](http://www.alseed.com)

[www.alseed.com](http://www.alseed.com)

ESBN plot in Chatham, Michigan at the Upper Peninsula Research and Extension Center



## Findings from the Field

*Dr. Rich Horsley, North Dakota State University barley breeder since 1988, provides oversight and guidance across the entire ESNB project. He shares his observations on varietal performance specific to the eastern states, which market primarily to the craft beer industry.*

One of the biggest limiting factors in 2015 and 2016 was susceptibility to pre-harvest sprouting (PHS). Conditions that are favorable for PHS are also conducive to production of deoxynivalenol (DON) by *Fusarium graminearum*. However, the DON levels in 2015 and 2016 were generally low. Perhaps this is due to lower temperatures during grain fill, which are less conducive for FHB development. This might be especially true in the northern Michigan, Vermont, and Maine ESNB sites.

The European developed varieties Acorn, Explorer, KWS Becky, KWS Fantex, LCS Genie, LCS Odyssey, Pioneer, Steffi, and SY Sirish had the best resistance to PHS based on data collected using the Rapid ViscoAnalyzer. The varieties AAC Synergy, AC Metcalfe, CDC Meredith, and Ceversa appeared to have the least resistance.

Based on observations from the 2015 and 2016 ESNB, meeting grain protein and plump kernel minimums at most locations will not be an issue in most years.

Wort  $\beta$ -glucan levels were lowest in grain from Fargo, ND and substantially greater in grain from the eastern test sites. This same phenomenon was observed last year.

2016 was the first year that the ESNB had a large number of European entries (9). Means across these nine European varieties for agronomic performance, barley quality, and malt quality are compared to the means for these same traits across 10 North American two-rowed varieties. For all traits, the means for the European varieties were superior to that of the North American varieties. It will be interesting in 2017 to see if the advantages of the European varieties are repeated.



**Table 2.** Agronomic, grain quality, and malt analysis data for Chatham, MI

Variety	Type	Heading Date	% Moisture	Test weight (cm)	Height (cm)	Yield (Bu/ac)	DON	Protein	RVA	% Plump	Malt Extract (%)	Wort Protein	S/T (%)	°ASBC	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)
2ND28065	2	7/8/2016	15.0	51.0	74.5	78.4	0.0	12.8	45	95.5	80.9	5.57	40.8	79	53.7	258	201
AAAC Synergy	2	7/11/2016	15.0	47.8	70.3	82.7	0.0	13.6	5	95.1	80.7	7.58	52	80	67.6	70	280
AC Metcalfe	2	7/11/2016	15.1	48.4	72.8	64.3	0.0	15.1	5	89.1	78.9	*8.73	54.2	75	63.4	50	318
Acorn	2	7/12/2016	14.7	47.4	63.9	75.9	0.0	13.3	138	93.6	80.6	4.99	38.1	81	68.3	205	176
Bentley	2	7/9/2016	14.9	47.1	74.1	73.7	0.0	14.0	5	94.2	80.2	*8.04	54.1	93	70.7	62	*352
CDC Copeland	2	7/11/2016	14.8	48.1	71.1	65.9	0.0	13.8	6	92.6	80.6	*7.92	52.9	78	66.1	51	315
CDC Meredith	2	7/9/2016	15.2	47.1	68.2	61.7	0.0	13.5	5	90.4	80.8	*8.12	55.3	77	59.9	75	316
Cerveza	2	7/11/2016	15.0	46.9	63.9	70.2	0.0	12.6	5	87.4	81.8	7.45	53.3	65	66.4	115	292
Conlon	2	7/7/2016	14.9	47.7	59.3	67.5	0.0	14.4	32	97.1	78.8	5.87	39.2	114	75.6	533	209
Explorer	2	7/12/2016	15.1	47.9	62.7	65.1	0.0	14.1	62	93.4	78	5.63	38.8	106	94.9	87	189
Innovation	6	7/3/2016	15.2	48.1	63.1	66.3	0.0	14.6	8	96.6	78.2	7.18	45.1	121	61.7	199	276
KWS Beckie	2	7/13/2016	14.7	46.6	53.8	75.4	0.0	13.4	153	96.4	79.2	5.09	36	86	55.9	276	192
KWS Fantex	2	7/11/2016	14.8	48.6	54.6	75.7	0.0	13.4	131	93.9	80.1	5.44	40	87	59.7	293	202
Lacey	6	7/3/2016	15.2	49.0	69.8	75.0	0.0	14.4	63	97.0	78.7	5.99	40.9	141	68.8	196	204
LCS Concerto	2	7/13/2016	14.9	48.1	63.9	68.2	0.0	13.5	71	94.8	80.2	5.33	39	74	77.3	176	194
LCS Genie	2	7/11/2016	15.0	49.4	64.3	71.2	0.0	12.3	179	92.2	80.5	5.17	41	103	63.4	60	174
LCS Odyssey	2	7/13/2016	14.8	48.0	59.3	77.1	0.0	12.5	165	97.4	80.9	5.08	39	83	64.3	99	166
LCS Overture	2	7/13/2016	14.7	47.6	62.2	58.6	0.0	13.6	130	92.9	80.5	5.62	38.5	80	78.5	275	226
LCS Westminster	2	7/11/2016	14.8	48.9	66.1	65.8	0.0	13.3	155	94.9	80.9	5.17	38.3	104	94.7	67	181
ND Genesis	2	7/9/2016	15.0	47.8	64.8	67.7	0.0	12.4	16	95.3	80.2	6.01	47	82	70.4	237	214
Newdale	2	7/11/2016	15.3	47.6	69.0	82.0	0.0	13.2	6	87.3	80.5	7.21	50.9	93	75.5	44	292
Pinnacle	2	7/5/2016	15.1	48.0	74.9	61.3	0.0	12.6	78	92.3	79.9	5.47	43	74	58.3	340	196
Pioneer	2	7/13/2016	15.1	48.0	56.3	62.5	0.0	14.3	67	93.4	77.7	5.54	38.6	97	96.7	90	201
Quest	6	7/5/2016	14.8	49.8	73.7	72.0	0.0	14.4	101	95.0	79	6	42.2	146	83	355	234
Robust	6	7/5/2016	15.0	48.7	70.7	73.0	0.0	14.7	65	95.3	78.3	6.11	39.9	130	53.6	306	234
Steffi	2	7/11/2016	14.7	49.2	66.9	80.6	0.0	14.8	171	87.9	77.2	5.24	33.5	78	60.9	356	171
SY Sirish	2	7/11/2016	14.7	48.6	60.6	70.5	0.0	12.8	106	96.8	79.3	5.19	39.3	89	63.1	89	172
Tradition	6	7/3/2016	15.1	49.2	67.7	71.8	0.0	14.5	80	96.7	78	5.87	39.3	168	61.8	500	208

**Table 3.** Agronomic, grain quality, and malt analysis data for Posen, MI

Variety	Type	Heading Date	% Moisture	Test weight (g)	Height (cm)	Yield (Bu/ac)	DON	Protein	RVA	% Plump	Malt Extract (%)	Wort Protein	S/T (%)	°ASBC	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)
2ND28065	2	7/7/2016	11.7	53.3	55.8	53.5	0.0	11.9	166	91.1	79.5	4.93	40	118	63.3	365	162
AAAC Synergy	2	7/10/2016	11.4	53.2	44.8	53.8	0.0	12.2	153	91.2	80.9	5.69	44.4	134	100.3	161	208
AC Metcalfe	2	7/9/2016	11.5	52.1	57.5	43.5	0.0	13.2	202	78.0	79.3	5.63	41.1	167	108.8	187	220
Acorn	2	7/11/2016	11.4	53.6	55.9	50.1	0.0	12.1	176	93.2	80.9	4.81	37.5	110	63.7	358	162
Bentley	2	7/3/2016	11.9	49.8	55.7	43.0	0.0	13.1	197	76.8	79.3	5.81	41.7	121	104.2	313	226
CDC Copeland	2	7/14/2016	12.0	49.7	42.6	32.9	0.0	13.2	188	83.1	78.6	5.94	42.5	154	93	231	222
CDC Meredith	2	7/4/2016	11.7	49.5	54.3	43.8	0.0	13.2	175	71.2	78.9	5.82	41.3	133	91.2	375	227
Cerveza	2	7/7/2016	11.7	50.6	54.1	51.5	0.0	12.1	195	69.4	81.6	5.24	41.9	121	102.7	320	186
Conlon	2	7/1/2016	11.4	52.6	57.0	51.3	0.0	12.5	158	92.5	78.4	5.23	39.6	131	74.7	517	180
Explorer	2	7/8/2016	11.8	52.7	51.5	52.8	0.0	12.2	187	93.8	79.2	5.35	42.1	99	87.6	245	195
Innovation	6	6/29/2016	11.0	50.1	56.0	46.4	0.0	13.2	179	80.7	78.5	5.24	40.3	190	67.5	437	185
KWS Beckie	2	7/8/2016	11.4	52.6	47.9	53.4	0.0	12.6	202	90.4	80	4.91	38.7	121	54.7	319	167
KWS Fantex	2	7/8/2016	11.6	53.1	50.8	59.0	0.0	11.8	175	85.3	79.9	4.79	38.3	119	55.9	284	170
Lacey	6	7/1/2016	11.4	50.8	59.2	46.7	0.0	12.7	174	76.3	78.2	5.01	39.9	182	70.5	280	167
LCS Concerto	2	7/11/2016	11.7	53.0	49.6	48.0	0.0	12.6	204	94.7	80.1	5.16	37.9	103	64.3	405	184
LCS Genie	2	7/11/2016	11.4	53.0	46.8	46.8	0.0	12.5	183	90.7	80	5.2	38.7	156	64.4	294	171
LCS Odyssey	2	7/11/2016	11.8	52.4	53.7	53.6	0.0	11.9	179	94.6	80.5	4.92	39.7	108	65.1	307	167
LCS Overture	2	7/12/2016	11.3	53.0	54.8	53.1	0.0	11.7	153	92.4	81.5	4.95	40.9	111	81.9	254	195
LCS Westminster	2	7/7/2016	11.4	53.9	55.1	50.0	0.0	12.6	174	94.7	79.9	5.24	38.3	126	78	255	180
ND Genesis	2	7/5/2016	11.8	54.0	56.7	54.5	0.0	10.9	129	91.3	79.9	4.78	41	106	78.8	472	164
Newdale	2	7/11/2016	11.7	51.9	55.0	47.9	0.0	12.8	179	67.2	79	5.16	37.3	152	98	279	177
Pinnacle	2	7/4/2016	11.4	53.3	50.7	53.2	0.0	10.9	179	89.8	80.9	4.81	39.5	107	59	445	162
Pioneer	2	7/12/2016	11.7	52.3	51.5	50.9	0.0	12.3	171	91.5	79.3	5.36	38.8	109	97.4	220	195
Quest	6	6/28/2016	11.2	51.3	57.5	49.4	0.0	12.8	197	78.1	78.9	5.31	41.7	164	73.2	348	190
Robust	6	6/30/2016	11.5	51.1	56.0	49.2	0.0	12.6	202	74.3	78.8	5.01	39.2	178	61.2	340	190
Steffi	2	7/8/2016	11.4	52.1	52.8	52.5	0.0	12.5	173	90.0	77.6	4.46	33.2	78	48.7	486	129
SY Sirish	2	7/10/2016	11.2	51.6	54.1	51.0	0.0	12.8	170	95.8	79.5	5.29	40.6	127	67.9	289	187
Tradition	6	6/30/2016	10.9	50.8	49.8	48.7	0.0	13.1	169	79.6	78.2	5.01	37.2	216	69.9	496	160

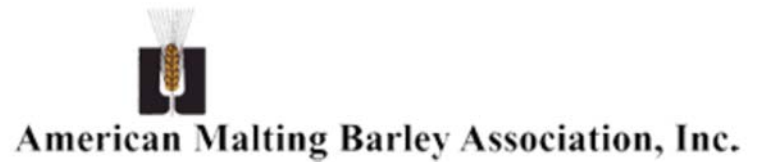


**Table 4.** Agronomic, grain quality, and malt analysis data for Hickory Corners, MI

Variety	Type	Heading Date	% Moisture	Test weight (cm)	Height (cm)	Yield (Bu/ac)	DON	Protein	RVA	% Plump	Malt Extract (%)	Wort Protein	S/T (%)	°ASBC	Alpha-amylase (20°DU)	Beta-glucan (ppm)	FAN (ppm)
2ND28065	2	6/22/2016	10.8	48.6	65.3	65.3	0.0	14.2	42	75.0	77.7	5.14	34.4	125	57.3	262	168
AAC Synergy	2	7/2/2016	11.8	48.4	72.7	64.8	0.0	14.3	6	78.4	79.3	7.07	46.7	118	86.9	70	273
AC Metcalfe	2	7/3/2016	11.4	50.0	64.7	53.0	0.0	15.6	6	69.8	77.5	7.12	42.5	140	90.2	95	263
Acorn	2	7/7/2016	12.1	46.9	65.7	49.6	0.0	14.7	148	66.4	76.9	5.03	30.7	113	72.6	284	165
Bentley	2	7/7/2016	10.4	45.1	67.3	53.2	0.0	14.6	6	63.3	78.3	7.26	46.5	111	93.1	138	318
CDC Copeland	2	7/7/2016	12.9	47.1	69.0	46.9	0.0	14.7	10	72.6	78	6.83	42.7	130	77.1	140	279
CDC Meredith	2	7/7/2016	13.4	46.9	57.0	51.2	0.0	14.7	6	62.8	78.7	7.42	48.2	111	77.5	98	321
Cerveza	2	7/7/2016	10.0	45.5	61.3	61.2	0.0	13.6	6	63.0	80.5	6.47	44.6	111	91.4	159	251
Conlon	2	6/22/2016	12.7	47.3	60.0	50.2	0.0	13.9	47	78.0	77.6	5.23	34.5	146	87	506	183
Explorer	2	7/7/2016	11.5	47.6	61.0	63.8	0.0	14.4	145	72.4	77.2	5.4	36.4	119	108.1	91	194
Innovation	6	6/22/2016	10.8	46.2	62.0	59.7	0.0	14.9	16	56.7	76.7	5.61	36.1	192	69.4	276	203
KWS Beckie	2	7/7/2016	12.0	45.0	55.7	68.5	0.0	13.7	142	77.5	76.9	4.78	32.9	117	56.2	232	170
KWS Fantex	2	7/7/2016	11.8	46.8	54.3	63.4	0.0	14.2	170	67.9	76.6	4.76	31.7	127	55.6	275	159
Lacey	6	6/22/2016	10.6	46.9	63.3	53.9	0.0	14.9	40	60.1	76.5	5.48	36.1	*226	79.2	238	197
LCS Concerto	2	7/3/2016	12.0	47.7	65.0	59.4	0.0	14.0	162	79.3	78.4	5.21	36.2	114	82.8	225	182
LCS Genie	2	7/7/2016	11.0	49.1	58.0	50.0	0.0	14.6	187	73.3	77.6	5.03	32.6	140	64.7	232	153
LCS Odyssey	2	7/7/2016	10.1	46.3	62.0	65.5	0.0	12.9	151	78.2	77.7	4.46	32.7	85	58.7	219	137
LCS Overture	2	7/7/2016	13.9	47.7	62.7	48.8	0.0	14.5	186	70.6	77.8	5.2	33.3	114	78.6	208	178
LCS Westminster	2	7/7/2016	11.9	49.4	65.3	59.5	0.0	13.9	132	79.4	78.6	4.95	33.3	120	78.8	222	155
ND Genesis	2	6/28/2016	12.3	47.1	69.3	69.1	0.0	12.6	14	82.6	78.6	5.27	39.2	113	70.6	236	185
Newdale	2	7/7/2016	10.4	45.3	65.0	60.3	0.0	15.4	9	47.0	77	6.25	36.4	151	86.5	186	215
Pinnacle	2	6/22/2016	13.1	46.1	66.0	57.9	0.0	12.5	148	79.8	79	4.92	37	108	66.1	419	171
Pioneer	2	7/7/2016	11.5	47.6	60.3	68.7	0.0	13.2	159	78.9	77.5	5.06	35.7	102	109	56	175
Quest	6	6/22/2016	10.1	47.5	71.0	58.7	0.0	14.5	81	62.0	77.7	5.51	38.9	183	85.6	354	204
Robust	6	6/22/2016	12.2	46.7	72.0	63.9	0.0	14.6	62	58.5	76.8	5.54	36.5	210	63.7	383	215
Steffi	2	7/7/2016	10.1	46.1	60.0	52.6	0.0	15.6	174	70.4	74.1	4.52	26.6	73	51.2	483	135
SY Sirish	2	7/7/2016	13.1	50.0	58.7	69.5	0.0	14.3	178	78.1	78.4	5.13	34.7	125	65.6	197	171
Tradition	6	6/22/2016	12.9	46.8	69.3	68.6	0.0	14.5	126	66.1	77.1	5.12	33.7	*233	74.8	308	177



The MSU Malting Barley Research Team would like to thank you for your support!



## Michigan State University Malting Barley Research Program

Upper Peninsula Research and Extension Center

Research and resources can be found at: [msue.anr.msu.edu/topic/info/malting\\_barley](https://msue.anr.msu.edu/topic/info/malting_barley)