

Table 1. Agronomic trait means of the 2018-2019 Winter Malting Barley Trial (WMBT)^a at 23 locations.

Trial location	Winter Survival (%)	Yield (Bu/A)	Heading date (Julian day)	Height (cm)	Lodging degree (0-9)	Lodging incidence (%)	Straw breakage (%)	Test Weight (lb/Bu)	Grain Protein-breeder measure (%)	Plump-breeder measure (%)	Deoxynivalenol content (ppm)	Fusarium Head Blight severity (%)	Fusarium Head Blight incidence (%)	BYDV susceptibility (0-9)	Leaf Scald severity (%)	Leaf Scald reaction (0-9)	Net blotch (net form) reaction (0-9)	Stripe Rust severity (%)
Fayetteville, AR	100.0	84.5	117.2	74.9	2.6	.	.	42.4	.	.	.	.	.	.	.	.	.	.
Georgetown, DE	100.0	118.6	115.5	65.1	.	.	.	41.1	.	.	.	.	.	.	.	.	.	.
Plains, GA	.	78.5	.	.	.	.	.	44.2	.	.	.	.	.	.	.	.	.	.
Schochoh, KY	100.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Versailles, KY	100.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
South Deerfield, MA	100.0	36.7	.	.	1.4	.	.	.	.	.	.	.	.	.	.	.	.	.
Clarksville, MD	100.0	104.6	120.0	65.1	3.5	.	.	45.3	.	87.3	.	.	.	.	.	.	.	.
Queenstown, MD	100.0	70.6	118.1	59.4	0.0	.	.	42.9	.	89.6	.	.	.	.	.	.	.	.
Hickory Corners, MI	100.0	83.0	150.2	84.3	0.5	.	.	42.5	.	95.1	2.5	.	.	.	.	.	.	.
Kawkawlin, MI	100.0	99.7	.	79.1	0.0	.	.	43.3	.	93.1	0.7	.	.	.	0.9	3.5	.	.
Saint Paul, MN	0.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Laurel Springs, NC	0.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Raleigh, NC	100.0	70.4	106.9	73.9	1.6	.	.	45.3	9.1	.	.	.	2.0	.	.	.	.	.
Farmington, NM	99.1	143.7	121.8	76.7	.	.	.	.	11.8	.	.	.	.	.	.	.	.	.
Ithaca, NY	65.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Wooster, OH	100.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Corvallis, OR	100.0	124.5	116.0	105.7	.	7.5	29.9	50.0	10.4	90.4	.	.	.	44.8	.	.	11.5	.
Blacksburg, VA	100.0	109.8	116.6	60.8	0.3	.	.	47.4	.	.	.	.	.	.	.	.	.	.
Mt. Holly, VA	.	.	113.4	.	.	.	.	.	.	.	19.0	16.5	29.9	.	.	.	.	.
Warsaw, VA	100.0	109.8	112.6	64.5	0.9	.	.	45.3	.	.	.	.	.	.	.	.	.	.
Alburgh, VT	24.1	.	156.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Alma, WI	0.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
River Falls, WI	0.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
GRAND MEAN	75.6	95.0	122.1	73.6	1.2	7.5	29.9	44.5	10.4	91.1	7.4	16.5	29.9	2.0	44.8	0.9	3.5	11.5

^a Agronomic data reported for 23 of 29 locations planted

Table 2. Malt quality trait means of the 2018-2019 Winter Malting Barley Trial (WMBT)^a at two locations.

Trial location	Kernel weight (mg)	Plump grains (%)	Malt extract (%)	Grain Protein (%)	Wort Protein (%)	S/T (%)	Diastatic Power °ASBC	Alpha Amylase (20°DU)	Beta Glucan (ppm)	Free Amino Nitrogen (ppm)	Grain color (°ASBC)	Wort color (°ASBC)	Wort clarity (1-3)
Hickory Corners, MI ^b	.	.	80.7	11.6	4.9	42.3	138.4	57.2	186.2	178.5	.	2.7	.
Raleigh, NC ^c	32.0	88.5	80.3	10.0	5.3	56.0	89.5	76.1	338.1	212.9	74.7	2.7	2.1
GRAND MEAN	32.0	88.5	80.5	10.5	5.2	52.7	105.6	75.3	269.5	208.1	74.7	2.7	2.1

^a Malt quality data reported for two of 29 locations planted

^b Malt quality data for Hickory Corners, MI courtesy of Hartwick College Center for Craft Food & Beverage, Oneonta, New York

^c Malt quality data for Raleigh, NC courtesy of the USDA-ARS Cereal Crops Research Unit, Madison, WI

Table 3. Winter Survival (%) line means for 2018-2019 Winter Malting Barley Trial (WMBT) entries at 21 locations.

Line	Line Mean	Fayetteville, AR	Georgetown, DE	Schochoh, KY	Versailles, KY	South Deerfield, MA	Clarksville, MD	Queenstown, MD	Hickory Corners, MI	Kawkawlin, MI	Saint Paul, MN	Laurel Springs, NC	Raleigh, NC	Farmington, NM	Ithaca, NY	Wooster, OH	Corvallis, OR	Blacksburg, VA	Warsaw, VA	Alburgh, VT	Alma, WI	River Falls, WI
CHARLES	75.0	100	100	100	100	100	100	100	100	100	0	0	100	100	45	100	100	100	100	30	0	0
THOROUGHbred	77.2	100	100	100	100	100	100	100	100	100	0	0	100	100	85	100	100	100	100	36	0	0
ENDEAVOR	75.9	100	100	100	100	100	100	100	100	100	0	0	100	100	67	100	100	100	100	26	0	0
WINTMALT	73.0	100	100	100	100	100	100	100	100	100	0	0	100	97	23	100	100	100	100	12	0	0
FLAVIA	76.9	100	100	100	100	100	100	100	100	100	0	0	100	100	85	100	100	100	100	30	0	0
LYBERAC	75.0	100	100	100	100	100	100	100	100	100	0	0	100	100	62	100	100	100	100	13	0	0
ROSSIGNOLA	77.5	100	100	100	100	100	100	100	100	100	0	0	100	100	87	100	100	100	100	41	0	0
MARQUETTA	76.6	100	100	100	100	100	100	100	100	100	0	0	100	100	82	100	100	100	100	27	0	0
HIRONDELLA	76.6	100	100	100	100	100	100	100	100	100	0	0	100	100	78	100	100	100	100	31	0	0
DH120304	75.5	100	100	100	100	100	100	100	100	100	0	0	100	100	70	100	100	100	100	16	0	0
DH140088	75.3	100	100	100	100	100	100	100	100	100	0	0	100	100	67	100	100	100	100	15	0	0
LIGHTNING	77.2	100	100	100	100	100	100	100	100	100	0	0	100	100	82	100	100	100	100	39	0	0
DH140963	76.8	100	100	100	100	100	100	100	100	100	0	0	100	88	82	100	100	100	100	43	0	0
08ARS509-1	75.0	100	100	100	100	100	100	100	100	100	0	0	100	100	60	100	100	100	100	15	0	0
08ARS632-5	74.5	100	100	100	100	100	100	100	100	100	0	0	100	100	62	100	100	100	100	3	0	0
13ARS537-13	72.9	100	100	100	100	100	100	100	100	100	0	0	100	100	30	100	100	100	100	0	0	0
13ARS537-19	75.0	100	100	100	100	100	100	100	100	100	0	0	100	100	43	100	100	100	100	32	0	0
GRAND MEAN	75.6	100	100	100	100	100	100	100	100	100	0	0	100	99.1	65.3	100	100	100	100	24.1	0	0

Table 4. Yield (Bu/A) line means for 2018-2019 Winter Malting Barley Trial (WMBT) entries at 13 locations.

Line	Line Mean	Fayetteville, AR	Georgetown, DE	Plains, GA	South Deerfield, MA	Clarksville, MD	Queenstown, MD	Hickory Corners, MI	Kawkawlin, MI	Raleigh, NC	Farmington, NM	Corvallis, OR	Blacksburg, VA	Warsaw, VA
CHARLES	84.5	67.2	107.9	69.3	29.7	86.6	54.4	63.1	56.8	80.0	161.8	109.0	103.3	109.4
THOROUGHbred	96.3	69.5	142.5	106.5	30.4	139.4	83.9	59.0	106.6	71.7	112.4	100.2	118.2	111.4
ENDEAVOR	94.5	60.3	127.7	101.5	25.6	127.5	81.6	66.4	69.5	73.3	172.4	103.4	113.1	106.1
WINTMALT	85.0	85.3	101.7	39.9	27.0	103.0	33.0	68.3	106.4	58.8	168.3	102.0	100.5	110.8
FLAVIA	100.2	94.3	141.6	65.9	44.4	120.7	66.1	95.5	116.3	64.8	154.0	132.8	96.5	109.6
LYBERAC	89.1	85.1	135.4	71.9	32.5	76.3	65.9	78.4	99.5	40.5	146.6	109.1	105.6	111.0
ROSSIGNOLA	104.9	99.3	102.2	94.1	42.1	100.1	89.7	116.2	116.4	68.0	148.7	156.0	136.0	95.4
MARQUETTA	106.9	85.5	134.7	90.7	41.5	104.7	115.6	101.8	120.4	80.7	117.6	163.8	133.0	99.2
HIRONDELLA	105.9	99.1	119.9	108.3	36.7	109.7	90.5	100.1	96.2	87.7	142.6	158.1	113.8	113.7
DH120304	93.8	89.7	108.0	56.3	42.5	109.9	55.5	78.0	109.0	56.7	159.3	135.0	100.2	119.9
DH140088	98.0	79.8	121.7	89.7	45.1	118.8	70.2	92.0	102.6	89.0	128.6	129.7	106.5	100.9
LIGHTNING	97.6	96.0	114.8	66.2	39.2	100.5	93.3	58.3	107.5	85.5	145.0	143.1	111.2	108.5
DH140963	97.9	89.3	113.2	59.1	40.4	107.5	37.7	97.6	116.0	69.6	130.2	176.6	103.2	132.0
08ARS509-1	94.7	77.9	105.3	91.1	41.2	91.9	56.9	100.9	112.1	71.9	187.0	85.8	98.3	111.5
08ARS632-5	88.9	78.7	126.8	72.8	38.0	113.0	51.6	78.2	66.8	78.2	147.9	81.0	105.3	118.2
13ARS537-13	90.8	94.7	103.6	85.8	35.5	96.7	71.5	92.3	94.2	64.9	96.7	128.1	111.9	103.9
13ARS537-19	85.3	85.1	108.6	65.3	32.7	71.2	82.3	64.6	99.3	56.4	124.0	102.6	110.7	105.7
GRAND MEAN	95.0	84.5	118.6	78.5	36.7	104.6	70.6	83.0	99.7	70.4	143.7	124.5	109.8	109.8

Table 5. Agronomic trait line means for 2018-2019 Winter Malting Barley Trial (WMBT) entries.

Line	Winter Survival (%)	Yield (Bu/A)	Heading date (Julian day)	Height (cm)	Lodging degree (0-9)	Lodging incidence (%)	Straw breakage (%)	Test weight (lb/Bu)	Grain Protein-breeder measure (%)	Plump-breeder measure (%)	Deoxynivalenol content (ppm)	Fusarium Head Blight severity (%)	Fusarium Head Blight incidence (%)	BYDV susceptibility (0-9)	Leaf Scald severity (%)	Leaf Scald reaction (0-9)	Net blotch (net form) reaction (0-9)	Stripe Rust severity (%)
CHARLES	75.0	84.5	120.3	68.2	2.6	10	80	41.3	10.5	88.8	6.45	15.0	20.0	2	90	2.0	3.3	0
THOROUGHBRED	77.2	96.3	120.0	79.1	2.0	0	85	45.0	9.8	84.3	4.38	15.5	17.5	0	50	0.0	4.7	53
ENDEAVOR	75.9	94.5	121.4	77.4	1.8	15	37	45.1	9.7	79.3	5.39	6.3	7.5	1	70	1.0	2.0	12
WINTMALT	73.0	85.0	126.4	74.2	0.6	3	25	43.1	10.0	93.4	11.73	19.0	30.0	4	50	1.3	2.0	18
FLAVIA	76.9	100.2	123.9	66.9	0.9	15	15	44.6	10.0	95.6	10.35	21.5	52.5	2	42	0.0	4.0	7
LYBERAC	75.0	89.1	123.5	70.6	1.4	12	20	44.0	10.0	94.4	7.99	22.3	37.5	4	27	2.7	4.0	17
ROSSIGNOLA	77.5	104.9	121.6	73.1	0.9	0	12	45.1	9.9	97.0	20.37	29.3	72.5	2	13	0.7	4.0	7
MARQUETTA	76.6	106.9	120.0	84.7	2.0	3	18	45.1	9.7	92.6	4.27	11.0	10.0	0	12	0.0	8.0	10
HIRONDELLA	76.6	105.9	123.2	78.7	0.9	5	12	44.2	10.2	96.6	7.54	19.3	37.5	0	8	0.0	3.0	10
DH120304	75.5	93.8	124.0	73.2	0.9	7	8	43.9	10.7	95.1	5.34	15.5	30.0	7	3	0.0	4.0	20
DH140088	75.3	98.0	122.6	76.1	1.0	17	10	45.2	11.2	97.4	5.57	12.5	27.5	2	8	1.3	1.0	5
LIGHTNING	77.2	97.6	123.9	76.2	0.8	17	13	46.3	10.8	95.8	2.75	14.5	30.0	2	13	0.7	6.3	8
DH140963	76.8	97.9	124.8	73.8	0.9	2	7	42.8	10.9	96.6	10.01	23.0	45.0	1	3	0.3	4.0	5
08ARS509-1	75.0	94.7	120.6	70.5	1.1	3	38	44.4	10.8	79.5	6.45	19.3	37.5	2	95	0.0	5.0	5
08ARS632-5	74.5	88.9	123.6	77.0	0.8	15	48	45.0	11.7	89.4	9.05	10.5	22.5	3	92	1.3	1.7	10
13ARS537-13	72.9	90.8	118.2	64.0	0.7	2	38	45.2	10.5	85.1	4.23	15.3	20.0	1	93	1.7	1.7	5
13ARS537-19	75.0	85.3	117.4	67.2	1.3	2	43	46.6	10.7	87.7	3.81	11.0	10.0	1	93	2.7	1.0	3
GRAND MEAN	75.6	95.0	122.1	73.6	1.2	7.5	29.9	44.5	10.4	91.1	7.39	16.5	29.9	2.0	44.8	0.9	3.5	11.5
# of Env.	21	13	12	11	9	1	1	11	3	5	3	1	1	1	1	1	1	1

Table 6. Malt quality trait line means for 2018-2019 Winter Malting Barley Trial (WMBT) entries at three locations.

Line	Kernel weight (mg)	Plump grains (%)	Malt extract (%)	Grain Protein (%)	Wort Protein (%)	S/T (%)	Diastatic Power °ASBC	Alpha Amylase (20°DU)	Beta Glucan (ppm)	Free Amino Nitrogen (ppm)	Grain color (°ASBC)	Wort color (°ASBC)	Wort clarity (1-3)
CHARLES	28.2	84.8	81.1	9.8	5.3	56.9	116.0	108.6	216.0	223.0	77	2.3	1
THOROUGHbred	29.1	88.2	79.5	10.2	4.5	45.7	114.5	57.9	449.5	150.0	83	2.1	3
ENDEAVOR	30.6	87.4	82.3	9.0	5.2	58.6	95.0	100.9	234.0	219.0	76	2.4	1
WINTMALT	32.7	90.8	79.3	11.4	5.5	49.2	99.5	61.0	226.0	223.5	75	3.4	3
FLAVIA	32.6	92.9	80.8	10.7	4.7	45.5	107.0	54.0	224.0	170.0	76	2.3	3
LYBERAC	34.1	94.4	81.9	10.0	4.9	49.1	119.0	56.8	191.5	180.5	71	2.2	3
ROSSIGNOLA	33.4	95.8	81.1	10.8	4.9	47.6	113.0	58.8	363.0	172.0	82	2.5	3
MARQUETTA	29.3	88.5	79.2	10.1	4.9	49.0	94.0	60.7	392.0	185.5	85	3.3	3
HIRONDELLA	33.1	93.5	79.5	10.9	4.9	47.9	121.5	56.3	342.5	180.0	65	2.8	3
DH120304	33.0	89.3	79.9	11.6	6.4	58.4	77.0	81.7	203.0	288.0	79	3.7	2
DH140088	34.4	86.8	80.1	9.4	5.4	61.5	58.0	85.5	259.0	241.0	76	3.2	1
LIGHTNING	34.9	92.8	79.7	11.4	5.3	47.0	125.5	52.8	197.5	194.0	83	2.2	3
DH140963	34.3	91.2	80.1	10.9	4.8	45.6	94.0	44.0	398.5	164.0	71	2.8	3
08ARS509-1	29.7	75.1	80.0	10.6	5.5	55.9	124.0	105.1	311.0	229.0	69	2.3	1
08ARS632-5	30.3	84.3	81.4	12.3	6.1	51.4	123.5	82.8	244.5	247.0	75	3.2	1
13ARS537-13	31.1	84.2	81.8	8.9	5.3	64.6	112.0	105.5	101.0	232.0	66	2.6	1
13ARS537-19	32.8	84.8	81.1	9.8	5.6	62.9	101.0	107.1	228.0	239.0	61	2.7	1
GRAND MEAN	32.0	88.5	80.5	10.5	5.2	52.7	105.6	75.3	269.5	208.1	74.7	2.7	2.1
# of Env. ^a	1	1	2	2	2	2	2	2	2	2	1	2	1

^a Malt quality data for traits with one environment is courtesy of the USDA-ARS Cereal Crops Research Unit, Madison, WI; malt quality data for traits with two environments is courtesy Hartwick College Center for Craft Food & Beverage, Oneonta, New York and USDA-ARS Cereal Crops Research Unit, Madison, WI

Table 7. Line entry details available for submissions to the 2018-2019 Winter Malting Barley Trial (WMBT).

Entry	Line	Row type	Submitter
1	CHARLES	2	
2	THOROUGHBRED	6	
3	ENDEAVOR	2	
4	WINTMALT	2	
5	FLAVIA	2	Ackermann Saatzucht GmbH
6	LYBERAC	2	Ackermann Saatzucht GmbH
7	ROSSIGNOLA	6	Ackermann Saatzucht GmbH
8	MARQUETTA	6	Ackermann Saatzucht GmbH
9	HIRONDELLA	6	Ackermann Saatzucht GmbH
10	DH120304	2	Oregon State U
11	DH140088	2	Oregon State U
12	LIGHTNING	2	Oregon State U
13	DH140963	2	Oregon State U
14	08ARS509-1	2	USDA-ARS Aberdeen
15	08ARS632-5	2	USDA-ARS Aberdeen
16	13ARS537-13	2	USDA-ARS Aberdeen
17	13ARS537-19	2	USDA-ARS Aberdeen