

Table 1. Agronomic trait means of the 2019-2020 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)	Test Weight (lb/Bu)	Grain Protein-breeder measure (%)	Plump-breeder measure (%)	Deoxynivalenol content (ppm)	BYDV susceptibility (0-9)	Leaf Scald severity (%)	Leaf Rust susceptibility (0-9)	Net blotch (net form) reaction (0-9)	Powdery Mildew susceptibility (0-9)	Stripe Rust severity (%)
Fayetteville, AR	100.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Georgetown, DE	100.0	122.5	109.9	77.7	1.9	41.5	.	.	.	.	.	.	.	.	.
Plains, GA	100.0	53.9	.	.	.	41.2	.	.	.	.	.	.	.	.	.
Aberdeen, ID	100.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Schochoh, KY	100.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Versailles, KY	100.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
South Deerfield, MA	100.0	95.3	.	.	.	.	.	.	.	.	.	.	.	.	.
Queenstown, MD	100.0	121.1	120.6	88.1	0.0	51.4	.	93.1	.	.	.	.	.	.	.
Hickory Corners, MI	96.7	107.5	146.8	.	0.0	44.0	.	93.7	0.1	.	.	.	.	.	.
Kawkawlin, MI	66.4	69.3	.	.	0.0	41.1	.	.	.	.	.	.	.	.	.
Saint Paul, MN	92.2	137.3	148.6	89.2	.	.	.	.	.	.	.	.	.	2.8	.
Laurel Springs, NC	0.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Raleigh, NC	100.0	.	107.9	.	.	.	.	.	.	2.2	.	.	4.5	.	.
Mead, NE	57.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Farmington, NM	.	92.2	.	.	.	.	8.0	.	.	.	.	.	.	.	.
Ithaca, NY	92.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Corvallis, OR	100.0	124.7	111.6	119.6	3.8	49.5	12.3	80.2	.	.	32.4	.	.	.	11.6
Memphis, TN	100.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Blacksburg, VA	100.0	92.3	116.4	81.1	.	47.0	.	.	.	.	.	.	3.5	.	.
Warsaw, VA	100.0	145.7	107.1	88.9	1.3	50.5	.	.	.	.	.	.	.	.	.
Alburgh, VT	93.8	92.9	148.5	60.0	0.4	44.2	.	.	.	.	.	0.2	.	0.6	.
Alma, WI	91.1	130.5	154.7	71.1	.	48.2	12.5	98.0	1.4	.	.	.	.	.	.
River Falls, WI	60.9	.	.	.	.	.	.	.	.	.	.	.	.	.	.
GRAND MEAN	92.0	108.2	128.0	84.5	1.1	45.7	9.3	91.0	0.3	2.2	32.4	0.2	3.9	1.7	11.6

^a Agronomic data reported for 23 of 26 locations planted

Table 2. Winter Survival (%) line means for 2019-2020 Winter Malting Barley Trial (WMBT) entries at 22 locations.

Line	Line Mean	Fayetteville, AR	Georgetown, DE	Plains, GA	Aberdeen, ID	Schochoh, KY	Versailles, KY	South Deerfield, MA	Queenstown, MD	Hickory Corners, MI	Kawkawlin, MI	Saint Paul, MN	Laurel Springs, NC	Raleigh, NC	Mead, NE	Ithaca, NY	Corvallis, OR	Memphis, TN	Blacksburg, VA	Warsaw, VA	Alburgh, VT	Alma, WI	River Falls, WI
CHARLES	91.8	100	100	100	100	100	100	100	100	100.0	60.0	93.3	0	100	28	91.7	100	100	100	100	95.0	100.0	60.0
THOROUGHbred	90.5	100	100	100	100	100	100	100	100	53.3	63.3	90.0	0	100	78	93.3	100	100	100	100	96.7	100.0	76.7
ENDEAVOR	93.5	100	100	100	100	100	100	100	100	100.0	70.0	100.0	0	100	42	92.7	100	100	100	100	98.3	100.0	61.7
WINTMALT	83.3	100	100	100	100	100	100	100	100	93.3	56.7	63.3	0	100	41	96.0	100	100	100	100	93.3	15.0	6.7
LIGHTNING	93.1	100	100	100	100	100	100	100	100	100.0	60.0	96.7	0	100	64	92.7	100	100	100	100	96.7	100.0	71.7
DH140088	91.9	100	100	100	100	100	100	100	100	100.0	66.7	93.3	0	100	56	91.7	100	100	100	100	93.3	93.3	40.0
DH140963	93.7	100	100	100	100	100	100	100	100	96.7	73.3	93.3	0	100	76	91.7	100	100	100	100	95.0	100.0	70.0
DH141132	93.5	100	100	100	100	100	100	100	100	96.7	60.0	100.0	0	100	75	92.7	100	100	100	100	95.0	100.0	81.7
FLAVIA	92.6	100	100	100	100	100	100	100	100	93.3	60.0	90.0	0	100	72	92.7	100	100	100	100	95.0	100.0	78.3
LYBERAC	92.6	100	100	100	100	100	100	100	100	100.0	73.3	86.7	0	100	45	95.0	100	100	100	100	98.3	93.3	60.0
ROSSIGNOLA	93.4	100	100	100	100	100	100	100	100	100.0	56.7	100.0	0	100	67	91.7	100	100	100	100	95.0	100.0	88.3
MARQUETTA	88.4	100	100	100	100	100	100	100	100	100.0	70.0	83.3	0	100	50	86.7	100	100	100	100	93.3	55.0	30.0
HIRONDELLA	93.1	100	100	100	100	100	100	100	100	96.7	56.7	100.0	0	100	64	93.3	100	100	100	100	98.3	100.0	71.7
PIXEL	91.3	100	100	100	100	100	100	100	100	100.0	73.3	86.7	0	100	62	90.0	100	100	100	100	91.7	80.0	56.7
VISUEL	93.8	100	100	100	100	100	100	100	100	100.0	73.3	100.0	0	100	72	92.7	100	100	100	100	93.3	100.0	60.0
DELICATESSE	93.3	100	100	100	100	100	100	100	100	100.0	70.0	96.7	0	100	65	95.0	100	100	100	100	93.3	93.3	68.3
KWS_ORBIT	94.6	100	100	100	100	100	100	100	100	100.0	76.7	100.0	0	100	76	93.3	100	100	100	100	90.0	100.0	86.7
KWS_FLEMMING	94.5	100	100	100	100	100	100	100	100	100.0	76.7	100.0	0	100	72	94.3	100	100	100	100	93.3	100.0	73.3
KWS_SCALA	92.7	100	100	100	100	100	100	100	100	90.0	66.7	100.0	0	100	72	90.0	100	100	100	100	93.3	100.0	56.7
KWS_SOMERSET	90.2	100	100	100	100	100	100	100	100	100.0	63.3	86.7	0	100	49	91.7	100	100	100	100	95.0	83.3	20.0
KWS_DONAU	91.5	100	100	100	100	100	100	100	100	90.0	70.0	86.7	0	100	46	92.7	100	100	100	100	93.3	100.0	50.0
KWS_FARO	91.5	100	100	100	100	100	100	100	100	100.0	56.7	90.0	0	100	58	90.0	100	100	100	100	93.3	100.0	43.3
MN-EQUINOX	93.8	100	100	100	100	100	100	100	100	100.0	63.3	100.0	0	100	70	94.3	100	100	100	100	95.0	100.0	75.0
08ARS509-1	91.3	100	100	100	100	100	100	100	100	100.0	73.3	93.3	0	100	59	88.3	100	100	100	100	90.0	86.7	28.3
08ARS632-5	89.2	100	100	100	100	100	100	100	100	100.0	50.0	86.7	0	100	38	93.3	100	100	100	100	85.0	83.3	46.7
13ARS537-13	93.2	100	100	100	100	100	100	100	100	100.0	80.0	86.7	0	100	41	91.7	100	100	100	100	93.3	100.0	76.7
13ARS537-19	91.8	100	100	100	100	100	100	100	100	100.0	63.3	93.3	0	100	44	90.0	100	100	100	100	91.7	90.0	75.0
AVALON	92.2	100	100	100	100	100	100	100	100	93.3	70.0	93.3	0	100	46	88.3	100	100	100	100	90.0	100.0	76.7
VA16M-84	91.2	100	100	100	100	100	100	100	100	100.0	75.0	83.3	0	100	33	94.3	100	100	100	100	95.0	70.0	76.7
GRAND MEAN	92.0	100	100	100	100	100	100	100	100	96.7	66.5	92.2	0	100	57.3	92.1	100	100	100	100	93.8	91.1	60.9

Table 3. Yield (Bu/A) line means for 2019-2020 Winter Malting Barley Trial (WMBT) entries at 13 locations.

Line	Line Mean	Georgetown, DE	Plains, GA	South Deerfield, MA	Queenstown, MD	Hickory Corners, MI	Kawkawlin, MI	Saint Paul, MN	Farmington, NM	Corvallis, OR	Blacksburg, VA	Warsaw, VA	Alburgh, VT	Alma, WI
CHARLES	92.4	87.8	19.2	90.3	128.7	85.0	57.2	125.8	98.4	63.8	78.1	137.8	86.7	117.7
THOROUGHbred	97.7	121.3	73.3	81.2	124.5	114.3	64.6	149.5	72.1	58.0	74.1	149.7	91.4	83.6
ENDEAVOR	105.4	149.1	58.6	86.4	131.7	85.0	62.5	136.1	83.2	76.4	78.4	144.1	96.4	145.9
WINTMALT	90.7	114.2	62.8	99.6	111.3	103.5	28.0	80.1	97.1	85.8	104.2	130.3	100.5	32.4
LIGHTNING	101.7	129.4	52.3	83.0	101.6	101.9	54.1	121.6	87.5	115.9	108.9	132.5	94.4	131.4
DH140088	102.5	107.9	57.2	108.8	119.5	108.4	95.9	106.8	99.6	110.3	81.6	138.1	74.9	106.3
DH140963	116.0	135.6	40.2	92.6	108.5	120.4	71.9	138.0	108.3	167.4	110.3	153.2	98.3	137.7
DH141132	116.3	126.1	64.8	84.2	118.7	114.4	68.0	135.2	108.8	152.3	120.1	150.0	98.1	154.1
FLAVIA	108.8	120.9	60.1	106.9	110.8	112.6	79.8	137.4	103.2	96.9	88.8	151.2	94.6	125.2
LYBERAC	107.7	120.9	60.3	113.1	119.7	121.8	41.0	110.9	91.6	96.9	83.6	146.4	96.3	138.0
ROSSIGNOLA	125.8	135.7	64.2	113.9	131.5	115.9	77.2	168.5	100.0	181.4	125.7	179.7	92.1	129.2
MARQUETTA	125.9	141.5	50.2	96.6	134.2	117.7	106.9	191.4	79.6	184.7	94.4	159.3	108.9	140.2
HIRONDELLA	117.3	109.7	48.5	108.2	141.5	104.3	90.2	168.4	105.7	152.5	97.7	149.0	101.7	124.9
PIXEL	131.3	156.4	41.7	103.8	132.6	123.2	74.3	185.2	106.3	198.8	120.1	168.3	112.2	134.5
VISUEL	122.2	154.9	98.3	87.2	131.5	117.0	60.2	170.1	83.2	197.9	117.1	152.9	75.5	146.0
DELICATESSE	113.7	133.6	67.0	108.4	125.0	114.9	70.5	121.3	121.9	133.9	94.6	144.8	100.3	126.4
KWS_ORBIT	127.6	159.6	48.1	124.4	137.6	86.8	76.6	160.2	86.1	189.6	115.3	161.9	114.8	154.4
KWS_FLEMMING	124.5	136.9	89.4	94.5	147.4	98.6	68.3	144.1	86.7	180.2	103.5	162.6	115.0	180.0
KWS_SCALA	100.9	111.7	54.7	95.9	121.9	99.7	70.6	122.4	98.1	105.7	78.9	114.8	83.8	138.4
KWS_SOMERSET	106.8	115.4	46.6	90.3	118.2	128.8	65.3	126.2	79.9	141.1	101.2	139.7	83.4	132.2
KWS_DONAU	106.6	127.6	16.1	105.6	134.0	103.2	43.5	140.1	91.1	140.8	79.0	135.3	92.6	126.1
KWS_FARO	128.4	149.2	50.1	97.6	146.5	131.6	103.7	165.5	80.5	169.5	113.1	177.6	114.6	143.4
MN-EQUINOX	88.8	77.7	10.6	70.8	106.7	81.3	47.2	130.0	65.1	121.0	74.5	135.9	92.9	114.5
08ARS509-1	103.9	115.2	47.5	79.8	105.9	113.0	92.6	140.9	108.3	83.6	80.6	143.5	90.2	127.2
08ARS632-5	100.8	124.7	47.1	101.6	125.7	118.2	59.4	124.1	88.4	69.6	82.3	146.5	76.0	143.5
13ARS537-13	99.7	98.8	64.4	91.7	110.1	102.7	78.9	123.2	107.9	86.0	63.4	146.4	67.2	145.0
13ARS537-19	87.2	74.9	53.7	67.4	101.3	77.4	92.1	122.1	90.5	71.2	44.3	122.9	80.9	142.5
AVALON	97.7	121.1	50.5	89.0	98.0	113.5	59.1	126.4	80.0	87.3	96.5	131.0	79.0	123.5
VA16M-84	89.2	97.3	64.3	91.5	89.9	92.0	33.3	108.8	63.9	99.2	66.6	119.8	82.6	104.2
GRAND MEAN	108.2	122.6	53.9	95.3	121.2	107.1	68.7	137.3	92.2	124.7	92.3	145.7	92.9	129.3

Table 4. Agronomic trait line means for 2019-2020 Winter Malting Barley Trial (WMBT) entries.

Line	Winter Survival (%)	Yield (Bu/A)	Heading date (Julian day)	Height (cm)	Lodging degree (0-9)	Test weight (lb/Bu)	Grain Protein-breeder measure (%)	Plump-breeder measure (%)	Deoxynivalenol content (ppm)	BYDV susceptibility (0-9)	Leaf Scald severity (%)	Leaf Rust susceptibility (0-9)	Net blotch (net form) reaction (0-9)	Powdery Mildew susceptibility (0-9)	Stripe Rust severity (%)
CHARLES	91.8	92.4	125.2	70.4	1.7	41.7	9.2	87.3	0.1	2.5	95.0	0.7	6.2	2.8	0.0
THOROUGHbred	90.5	97.7	126.3	89.1	0.8	46.3	9.1	75.1	0.1	1.5	5.0	0.0	8.0	2.0	85.0
ENDEAVOR	93.5	105.4	127.6	82.5	1.5	45.3	9.5	73.7	0.1	1.0	91.7	0.0	5.8	2.0	1.7
WINTMALT	83.3	90.7	133.0	80.8	0.7	44.2	9.0	90.3	0.1	3.5	65.0	0.0	3.8	1.5	13.3
LIGHTNING	93.1	101.7	129.8	85.9	1.2	48.1	9.9	96.1	0.7	1.0	5.0	0.0	2.8	0.2	8.3
DH140088	91.9	102.5	126.7	82.0	1.4	45.0	10.2	95.4	0.1	0.0	8.3	0.0	3.4	5.5	3.3
DH140963	93.7	116.0	130.5	83.9	0.9	45.7	9.1	95.2	0.1	1.5	5.0	0.0	5.0	0.2	5.0
DH141132	93.5	116.3	130.3	85.1	0.4	45.3	10.0	93.6	1.2	3.5	8.3	0.0	3.2	1.5	5.0
FLAVIA	92.6	108.8	130.0	77.1	0.8	46.5	8.7	92.8	0.1	1.0	43.3	0.3	2.8	1.2	6.7
LYBERAC	92.6	107.7	130.5	82.9	1.1	47.6	8.4	91.1	0.1	3.0	21.7	0.3	3.8	2.3	20.0
ROSSIGNOLA	93.4	125.8	127.6	84.3	0.9	46.3	8.5	95.9	0.2	4.0	13.3	0.0	3.0	0.3	5.0
MARQUETTA	88.4	125.9	126.5	94.6	1.7	47.0	9.2	96.1	0.8	1.5	6.7	0.0	4.4	0.3	10.0
HIRONDELLA	93.1	117.3	128.9	87.4	1.7	45.6	8.6	92.8	0.1	1.0	6.7	0.3	2.8	0.2	13.3
PIXEL	91.3	131.3	128.8	82.0	0.6	45.8	8.6	93.2	0.1	2.5	10.0	0.0	0.8	0.5	5.0
VISUEL	93.8	122.2	129.1	85.0	0.6	45.0	8.0	92.5	0.2	5.0	6.7	0.3	4.8	0.3	10.0
DELICATESSE	93.3	113.7	127.6	80.7	1.0	46.0	9.1	94.6	0.1	0.0	23.3	0.0	2.0	2.5	5.0
KWS_ORBIT	94.6	127.6	130.6	95.6	0.1	44.5	8.8	95.4	0.9	3.0	10.0	0.0	1.8	0.0	8.3
KWS_FLEMMING	94.5	124.5	130.8	94.5	0.3	43.7	9.5	93.3	0.7	3.0	3.3	0.0	3.4	0.3	8.3
KWS_SCALA	92.7	100.9	127.6	75.8	1.1	44.3	9.7	94.3	1.1	0.0	65.0	0.0	4.2	0.8	0.0
KWS_SOMERSET	90.2	106.8	130.1	86.4	1.2	45.9	9.2	94.8	0.1	3.5	10.0	0.3	3.2	0.8	10.0
KWS_DONAU	91.5	106.6	129.1	82.0	1.0	45.9	9.7	96.6	0.6	4.0	13.3	0.0	3.8	1.5	10.0
KWS_FARO	91.5	128.4	126.9	86.0	0.2	46.9	9.5	94.1	0.2	2.5	8.3	0.0	2.2	0.0	10.0
MN-EQUINOX	93.8	88.8	124.4	95.9	2.3	44.2	9.8	82.0	0.2	7.5	5.0	0.7	4.6	5.0	1.7
08ARS509-1	91.3	103.9	125.3	79.5	1.4	45.2	9.3	79.2	0.0	3.0	81.7	0.7	5.2	2.5	6.7
08ARS632-5	89.2	100.8	130.7	84.9	1.6	45.6	10.0	92.0	1.3	1.5	70.0	0.7	3.6	1.8	20.0
13ARS537-13	93.2	99.7	122.6	68.8	0.8	46.2	9.8	87.8	0.5	2.5	91.7	0.7	5.6	2.7	0.0
13ARS537-19	91.8	87.2	120.9	70.1	1.0	46.4	9.8	87.8	0.0	0.0	90.0	1.0	5.4	4.8	5.0
AVALON	92.2	97.7	126.6	96.7	1.6	47.4	10.2	92.6	0.1	0.0	40.0	0.3	4.0	2.2	31.7
VA16M-84	91.2	89.2	126.6	99.3	1.0	49.2	10.3	93.3	0.0	0.0	35.0	0.3	3.6	2.8	26.7
GRAND MEAN	92.0	108.2	128.0	84.5	1.1	45.7	9.3	91.0	0.33	2.2	32.4	0.2	3.9	1.7	11.6
# of Env.	22	13	10	8	7	10	3	4	2	1	1	1	2	2	1

Table 5. Line entry details available for submissions to the 2019-2020 Winter Malting Barley Trial (WMBT).

Entry	Line	Row type	Submitter
1	CHARLES	2	
2	THOROUGHBRED	6	
3	ENDEAVOR	2	
4	WINTMALT	2	
5	LIGHTNING	2	Oregon State U
6	DH140088	2	Oregon State U
7	DH140963	2	Oregon State U
8	DH141132	2	Oregon State U
9	FLAVIA	2	Ackermann Saatzeit GmbH
10	LYBERAC	2	Ackermann Saatzeit GmbH
11	ROSSIGNOLA	6	Ackermann Saatzeit GmbH
12	MARQUETTA	6	Ackermann Saatzeit GmbH
13	HIRONDELLA	6	Ackermann Saatzeit GmbH
14	PIXEL	6	Secobra
15	VISUEL	6	Secobra
16	DELICATESSE	2	Secobra
17	KWS_ORBIT	6	KWS Cereals
18	KWS_FLEMMING	6	KWS Cereals
19	KWS_SCALA	2	KWS Cereals
20	KWS_SOMERSET	2	KWS Cereals
21	KWS_DONAU	2	KWS Cereals
22	KWS_FARO	6	KWS Cereals
23	MN-EQUINOX	6	U of Minnesota
24	08ARS509-1	2	USDA-ARS Aberdeen
25	08ARS632-5	2	USDA-ARS Aberdeen
26	13ARS537-13	2	USDA-ARS Aberdeen
27	13ARS537-19	2	USDA-ARS Aberdeen
28	AVALON	2	Virginia Tech
29	VA16M-84	2	Virginia Tech