

Table 1. Agronomic trait means of the 2022-2023 Winter Malting Barley Trial (WMBT)^a at 24 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 (%)	Thin grain (%)	Deoxynivalenol content (ppm)	Fusarium Head Blight severity (%)	Fusarium Head Blight incidence (%)	Leaf Rust severity (%)	Leaf Scald severity (%)	Powdery Mildew susceptibility (0-9)	Stripe Rust severity (%)	Stripe Rust infection (0-9)	
South Deerfield, MA	100.0	40.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chatham, MI	0.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
East Lansing, MI	88.0	105.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Empire, MI	73.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hickory Corners, MI	.	84.1	.	.	.	.	.	.	14.0	46.4	12.0	.	.	.	.	.	.	.	.	.
Rudyard, MI	5.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Becker, MN	8.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Crookston, MN	13.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Saint Paul, MN	35.6	46.3	153.1	68.5	.	.	3.0	46.6	.	.	.	.	.	.	.	.	1.2	.	.	.
Raleigh FHB, NC	.	.	.	.	.	.	.	.	.	.	.	31.09	31.5	86.3	.	.	.	.	.	.
Mead, NE	0.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Farmington, NM	100.0	41.3	.	.	.	.	.	.	9.1	.	.	.	.	.	.	.	.	.	.	.
Tucumcari, NM	100.0	78.8	123.5	53.6	.	.	.	43.2	.	.	.	.	.	.	.	.	.	.	.	.
Ithaca, NY	65.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Custar, OH	100.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Corvallis, OR	100.0	98.4	129.5	95.2	.	0.0	.	56.0	9.7	97.1	.	.	.	.	24.8	.	.	.	.	.
Memphis, TN	0.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Logan, UT	76.9	93.9	155.8	69.1	0.5	.	.	51.3	.	95.5	.	.	.	.	.	.	.	.	.	.
Blacksburg, VA	100.0	154.4	115.9	101.3	1.1	.	.	50.1	.	.	.	.	.	.	.	.	.	.	.	.
Warsaw, VA	100.0	130.2	106.8	74.9	0.7	.	.	48.0	.	.	.	.	.	.	.	.	.	.	.	.
Alburgh, VT	59.8	56.4	142.8	.	0.0	0.0	.	44.3	.	.	.	.	.	.	.	.	.	.	.	.
Mt Vernon, WA	.	.	.	.	.	.	.	.	.	.	.	.	.	28.4	.	.	.	7.8	2.5	.
Pullman Rust, WA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.7	0.6	.
New Auburn, WI	83.5	27.9	160.3	82.3	0.4	2.3	.	45.7	.	.	.	.	.	.	.	.	.	.	.	.
GRAND MEAN	65.5	75.7	135.9	78.2	0.5	0.9	3.0	47.4	10.2	86.0	12.0	31.09	31.5	86.3	28.4	24.8	1.2	5.5	1.9	

^a Agronomic data reported for 24 of 31 locations planted

Table 2. Winter Survival (%) line means for 2022-2023 Winter Malting Barley Trial (WMBT) entries at 20 locations.

Line	Line Mean	South Deerfield, MA	Chatham, MI	East Lansing, MI	Empire, MI	Rudyard, MI	Becker, MN	Crookston, MN	Saint Paul, MN	Mead, NE	Farmington, NM	Tucumcari, NM	Ithaca, NY	Custar, OH	Corvallis, OR	Memphis, TN	Logan, UT	Blacksburg, VA	Warsaw, VA	Alburgh, VT	New Auburn, WI
CHARLES	64.5	100	0	100.0	83.1	0.0	0.0	7.7	30.0	0	100	100	30.0	100	100	0	100.0	100	100	74.7	83.8
FLAVIA	67.1	100	0	93.5	81.6	8.8	23.3	60.0	7.0	0	100	100	80.0	100	100	0	60.0	100	100	63.7	77.5
LCS_VIOLETTA	69.4	100	0	91.3	82.4	0.0	2.0	1.0	56.7	0	100	100	66.7	100	100	0	100.0	100	100	76.0	80.6
WINTMALT	59.3	100	0	91.2	58.6	3.7	4.0	11.0	43.3	0	100	100	65.0	100	100	0	76.7	.	.	56.7	83.8
MAROUETTA	69.3	100	0	86.4	69.4	6.7	5.0	40.0	80.0	0	100	100	51.7	100	100	0	100.0	100	100	56.7	83.1
HIRONDELLA	72.2	100	0	84.1	87.0	13.0	3.7	10.0	90.0	0	100	100	66.7	100	100	0	100.0	100	100	73.7	83.8
13ARS503-1	66.3	100	0	87.4	93.8	8.1	0.3	20.0	3.7	0	100	100	81.7	100	100	0	100.0	100	100	34.0	83.1
13ARS526-8	63.7	100	0	82.7	75.3	10.0	3.3	0.0	40.0	0	100	100	63.3	100	100	0	100.0	.	.	57.7	90.0
13ARS514-5	65.0	100	0	92.5	79.1	3.8	1.7	0.0	66.7	0	100	100	53.3	100	100	0	98.3	.	.	59.3	88.8
VA17M-13DH1720LX	61.3	100	0	98.9	58.5	0.0	5.3	1.0	2.3	0	100	100	88.3	100	100	0	30.0	100	100	46.0	80.6
VA19M-16DH2261	62.0	100	0	84.4	72.3	0.0	10.3	1.0	4.0	0	100	100	65.0	100	100	0	43.3	100	100	54.0	86.3
AVALON	61.1	100	0	91.7	82.2	5.0	1.7	1.0	2.3	0	100	100	36.7	100	100	0	56.7	100	100	47.7	81.9
VA20MFHB-18DH541	67.8	100	.	.	.	.	18.3	.	2.3	0	100	100	55.0	100	100	0	16.7	100	100	53.3	85.6
RIL02FL-029	60.9	100	0	96.1	70.2	3.8	0.3	10.0	8.3	0	100	100	68.3	100	100	0	23.3	100	100	47.3	81.3
RIL0257-01-011	64.7	100	0	91.2	71.0	20.2	0.0	40.0	3.7	0	100	100	73.3	100	100	0	60.0	100	100	59.3	80.0
RIL523-PFFN-033	67.2	100	0	92.0	78.1	3.3	0.7	60.0	26.7	0	100	100	81.7	100	100	0	76.7	100	100	61.0	77.5
DH02FL-028	66.1	100	0	90.0	66.4	3.1	3.3	10.0	15.0	0	100	100	86.7	100	100	0	76.7	100	100	64.3	85.6
DH141917	64.5	100	0	81.0	84.2	3.6	0.7	30.0	26.7	0	100	100	36.7	100	100	0	76.7	100	100	62.3	83.8
DH150683	68.5	100	0	84.5	68.3	7.3	28.3	1.0	36.7	0	100	100	78.3	100	100	0	90.0	100	100	67.7	78.8
DH162310	66.8	100	0	74.3	90.6	3.2	0.3	10.0	20.0	0	100	100	81.7	100	100	0	86.7	100	100	58.3	87.5
DH170472	59.8	100	0	66.9	78.7	4.5	2.0	0.0	3.3	0	100	100	78.3	100	100	0	16.7	100	100	56.7	77.5
NB21214	74.5	100	0	97.0	96.3	1.8	.	.	.	0	100	100	70.0	100	100	0	100.0	.	.	75.0	83.8
PIXEL	60.1	100	0	74.7	48.9	15.3	3.3	2.0	3.7	0	100	100	80.0	100	100	0	20.0	100	100	58.3	83.1
DEMENTIEL	68.7	100	0	85.7	69.2	0.0	0.7	2.0	80.0	0	100	100	45.0	100	100	0	100.0	100	100	75.0	85.6
CONSTEL	68.7	100	0	85.2	64.5	9.0	3.3	0.0	56.7	0	100	100	75.0	100	100	0	100.0	100	100	63.3	85.0
CAROUSSEL	67.2	100	0	79.6	57.5	1.8	2.3	50.0	53.3	0	100	100	58.3	100	100	0	100.0	100	100	57.7	86.9
2MW18_3374-001	61.7	100	0	86.7	60.5	1.8	23.3	10.0	30.0	0	100	100	51.7	100	100	0	100.0	.	.	51.7	83.8
2MW18_3374-036	68.5	100	0	92.7	78.8	1.9	27.0	1.0	80.0	0	100	100	71.7	100	100	0	100.0	.	.	66.7	82.5
2MW18_4462-011	68.2	100	0	90.8	70.0	7.2	33.3	10.0	100.0	0	100	100	58.3	100	100	0	100.0	.	.	47.7	85.0
2MW19_3013-004	68.2	100	0	91.1	69.7	7.1	33.7	10.0	60.0	0	100	100	73.3	100	100	0	100.0	.	.	69.0	88.1
GRAND MEAN	65.8	100	0	87.7	74.0	5.3	8.3	14.2	35.6	0	100	100	65.7	100	100	0	76.9	100	100	59.8	83.5

Table 3. Yield (Bu/A) line means for 2022-2023 Winter Malting Barley Trial (WMBT) entries at 12 locations.

Line	Line Mean	South Deerfield, MA	East Lansing, MI	Hickory Corners, MI	Saint Paul, MN	Farmington, NM	Tucumcari, NM	Corvallis, OR	Logan, UT	Blacksburg, VA	Warsaw, VA	Alburgh, VT	New Auburn, WI
CHARLES	73.6	33.9	68.4	76.5	32.4	34.2	78.7	100.0	132.6	140.0	123.3	63.1	19.0
FLAVIA	83.7	32.3	143.1	99.5	47.1	39.7	79.8	125.1	63.3	158.9	137.6	62.3	22.0
LCS_VIOLETTA	81.6	47.0	99.2	74.9	31.8	35.9	75.0	112.3	117.5	149.3	137.6	70.9	38.6
WINTMALT	59.0	42.8	110.7	77.1	19.2	44.1	69.7	106.7	86.5	.	.	32.5	18.3
MARQUETTA	92.4	56.6	84.4	108.8	94.6	36.9	64.6	105.9	142.4	188.0	138.7	78.2	34.0
HIRONDELLA	92.0	58.7	116.3	97.4	74.2	47.3	67.8	89.2	127.3	175.6	135.1	88.1	37.4
13ARS503-1	86.7	28.6	120.3	103.8	30.5	37.2	89.0	110.9	142.8	159.2	127.5	39.8	31.6
13ARS526-8	69.0	25.6	92.3	74.3	45.2	39.3	81.2	102.2	145.4	.	.	69.3	28.8
13ARS514-5	65.2	36.1	112.8	46.3	47.9	64.3	82.4	101.7	124.3	.	.	35.5	21.2
VA17M-13DH1720LX	76.9	51.9	110.2	65.5	42.3	36.5	73.0	122.1	44.4	144.6	133.4	53.7	33.8
VA19M-16DH2261	71.2	50.6	100.3	87.0	25.0	43.7	72.5	83.7	44.5	139.3	123.9	51.2	30.1
AVALON	69.0	35.1	71.2	102.0	33.7	26.8	82.1	89.0	65.1	137.1	122.0	10.4	21.8
VA20MFHB-18DH541	69.4	33.8	.	.	17.7	27.6	81.5	109.6	22.1	150.3	139.9	68.9	23.6
RIL02FL-029	73.1	50.1	103.1	75.6	24.7	33.5	97.3	102.0	45.1	141.9	135.2	44.0	23.6
RIL0257-01-011	67.0	36.7	91.7	84.8	21.6	46.3	53.8	78.7	64.9	131.7	134.3	34.8	17.1
RIL523-PFFN-033	67.4	32.7	97.4	58.7	50.8	48.4	55.5	88.3	87.7	105.6	127.1	34.6	20.7
DH02FL-028	79.9	40.0	84.0	85.8	12.2	59.6	75.0	117.5	94.7	150.1	147.8	69.4	36.2
DH141917	71.9	33.6	99.2	81.9	24.4	39.1	97.2	91.0	76.3	145.1	116.2	52.6	28.5
DH150683	86.2	39.8	127.3	90.1	48.5	16.1	88.8	119.2	110.7	158.2	130.9	80.3	39.4
DH162310	75.6	35.6	100.0	87.9	37.5	41.2	85.3	116.5	98.7	152.1	118.5	48.6	26.5
DH170472	67.9	34.0	74.4	75.6	16.0	45.4	70.6	100.6	34.8	152.9	136.6	48.9	22.5
NB21214	58.0	27.3	105.4	63.7	.	32.3	83.3	72.0	75.9	.	.	66.5	23.8
PIXEL	85.1	56.8	119.8	89.0	36.3	51.4	90.2	105.7	46.3	195.4	139.9	70.1	23.9
DEMENTIEL	86.6	35.4	138.1	94.2	79.5	53.7	69.0	98.1	129.6	170.4	103.0	66.1	18.7
CONSTEL	93.2	56.5	110.3	88.6	73.2	52.7	70.6	109.1	136.4	179.0	160.9	62.4	37.5
CAROUSSEL	82.9	45.0	121.4	86.5	55.8	45.8	79.9	88.0	131.2	170.4	94.2	56.7	35.0
2MW18_3374-001	63.9	53.7	100.0	95.9	52.5	43.1	85.4	39.3	103.2	.	.	41.0	35.2
2MW18_3374-036	68.0	41.0	115.2	86.5	62.7	42.5	85.5	80.4	89.3	.	.	60.6	27.5
2MW18_4462-011	68.1	41.4	120.5	75.9	57.3	48.2	85.7	79.1	114.9	.	.	45.7	33.0
2MW19_3013-004	69.1	32.8	88.7	107.9	60.3	27.4	94.3	107.9	117.6	.	.	57.7	30.2
GRAND MEAN	75.1	40.8	104.3	84.2	43.3	41.3	78.8	98.4	93.9	154.3	130.2	55.5	28.0

Table 5. Malt quality^a trait line means for 2022-2023 Winter Malting Barley Trial (WMBT) entries at St. Paul, MN.

Line	Malt extract (%)	Malt Protein (%)	Wort Protein (%)	S/T (%)	Diastatic Power °ASBC	Alpha Amylase (20°DU)	Beta Glucan (ppm)	Free Amino Nitrogen (ppm)	Viscosity (mPa)	Wort color °ASBC
CHARLES	76.4	73.9	16.5	18.2	6.0	33.0	198	79.2	156	249
FLAVIA	39.4	76.4	13.8	17.2	6.2	35.9	223	69.0	91	255
LCS_VIOLETTA	69.6	74.3	14.6	14.6	4.6	31.5	223	53.1	209	157
MARQUETTA	78.8	74.1	12.7	12.9	4.2	32.4	145	53.7	374	151
HIRONDELLA	82.0	72.3	16.7	17.2	4.9	28.5	194	54.8	265	181
13ARS526-8	76.2	76.0	15.2	15.9	6.0	37.6	193	90.1	147	271
13ARS514-5	55.6	75.4	15.1	15.9	6.3	39.5	269	91.3	147	295
VA17M-13DH1720LX	64.7	73.5	15.0	15.8	4.2	26.6	173	49.9	252	139
VA19M-16DH2261	84.9	71.7	15.6	17.1	3.9	22.8	178	48.5	373	122
RIL02FL-029	61.4	73.9	17.8	19.3	4.9	25.2	258	51.4	362	165
RIL0257-01-011	77.1	71.1	16.9	16.9	4.4	26.2	226	52.5	232	148
RIL523-PFFN-033	61.6	74.9	15.0	16.2	4.5	27.7	126	47.0	311	141
DH141917	80.4	73.6	17.7	18.1	6.0	33.3	222	58.1	109	217
DH150683	72.3	72.6	15.6	15.3	4.3	27.9	184	46.9	187	134
DH162310	81.7	74.6	16.8	16.8	6.0	35.9	267	74.2	180	248
PIXEL	82.0	74.0	15.1	16.4	4.4	26.9	222	54.9	336	157
DEMENTIEL	40.6	73.2	12.7	11.9	4.7	39.6	131	55.9	203	173
CONSTEL	59.9	75.0	13.4	14.2	4.6	32.7	181	56.2	201	172
CAROUSSEL	58.8	73.5	13.6	15.0	4.4	29.0	202	49.6	236	160
2MW18_3374-001	94.1	74.5	15.9	17.9	4.7	26.3	269	52.1	287	171
2MW18_3374-036	77.2	75.1	15.2	16.7	5.1	30.4	180	53.3	181	188
2MW18_4462-011	65.2	76.2	11.6	11.8	5.0	42.5	123	60.7	183	188
2MW19_3013-004	82.2	76.5	13.0	14.1	4.5	31.5	151	48.1	122	146
GRAND MEAN	70.5	74.2	15.0	15.9	4.9	31.4	197.3	58.7	223.7	183.8

^a Malt quality data courtesy of Rahr Malting Co., Shakopee, MN

Table 6. Line entry details available for submissions to the 2022-2023 Winter Malting Barley Trial (WMBT).

Entry	Line	Row type	Submitter
1	CHARLES	2	
2	FLAVIA	2	
3	LCS_VIOLETTA	2	
4	WINTMALT	2	
5	MARQUETTA	6	Ackermann Saatzucht GmbH
6	HIRONDELLA	6	Ackermann Saatzucht GmbH
7	13ARS503-1	2	USDA-ARS Aberdeen
8	13ARS526-8	2	USDA-ARS Aberdeen
9	13ARS514-5	2	USDA-ARS Aberdeen
10	VA17M-13DH1720LX	6 lax	Virginia Tech
11	VA19M-16DH2261	2	Virginia Tech
12	AVALON	2	Virginia Tech
13	VA20MFHB-18DH541	2	Virginia Tech
14	RIL02FL-029	2	Ohio State U
15	RIL0257-01-011	2	Ohio State U
16	RIL523-PFFN-033	2	Ohio State U
17	DH02FL-028	2	Ohio State U
18	DH141917	2	Oregon State U
19	DH150683	2	Oregon State U
20	DH162310	2	Oregon State U
21	DH170472	2	Oregon State U
22	NB21214	2	U of Nebraska
23	PIXEL	6	Secobra
24	DEMENTIEL	6	Secobra
25	CONSTEL	6	Secobra
26	CAROUSSEL	6	Secobra
27	2MW18_3374-001	2	U of Minnesota
28	2MW18_3374-036	2	U of Minnesota
29	2MW18_4462-011	2	U of Minnesota
30	2MW19_3013-004	2	U of Minnesota