2019 Barley Field Crop Trials Results

Minnesota Agricultural Experiment Station and the College of Food, Agricultural and Natural Resource Sciences

Spring barley varieties were evaluated in 2019 in replicated trials at Crookston, Hallock, Oklee, Perley, Stephen, Roseau and Strathcona in the northern part of the state and Fergus Falls, Le Center, Morris, Rochester and St. Paul in the south. Data collected from these trials should be used to make comparisons only among those varieties included in the trials. Yield is reported for 2019 and multi-year averages as percent of the mean of the trial. In 2019, the lowest yielding trial was at Hallock and the highest yielding at Crookston. LSD numbers beneath the yield columns indicate whether the difference between yields is due to genetics or to other factors, such as variations in environment. If yield difference between two entries equals or exceeds the LSD value the higher-yielding entry probably was superior in yield. A difference less than the LSD value was probably due to environmental factors.

Variety Selection Criteria

Most barley producers in the region grow barley for malt and select varieties approved by the American Malting Barley Association (AMBA). The most important industry specifications for making malting grade are low grain protein (11.5% - 13.5%), kernel plumpness (>80%) and low deoxynivalenol or DON content (<2 ppm). DON is the toxin produced by the Fusarium head blight (FHB) pathogen. Additional information about FHB can be found at https://scabsmart.org. Please consult the AMBA recommended varieties for the most current information about industry acceptance of malting barley varieties at www.ambainc.org. Variety selection will also be influenced by contracts made available by malting and brewing companies and these vary from year to year.

In addition to yield and acceptable malt quality, disease resistance plays an important role in variety selection. Disease evaluations are carried out in inoculated field and/or greenhouse experiments. Disease ratings are based on the results of two or more experiments and are scored on a 1–9 scale where 1 = most resistant and 9 = most susceptible. For most producers the disease FHB and the presence of DON in harvested grain are the two most important factors limiting production of malting barley in the region. The two-rowed variety Conlon has the lowest DON score (the mycotoxin produced by the Fusarium head blight pathogen) compared to the other varieties grown in the region.

The other diseases listed in the disease reactions table are leaf diseases that can be a problem in Minnesota. Pinnacle is very susceptible to net blotch (data not shown). All varieties have resistance to the dominant race of stem

Table 1. Agronomic characteristics of malting barley varieties, 2017-2019.

Variety	Origin[1]	Year of Release	PVP Status	Heading (DAP)	Height (inches)	Lodging (0-9)[2]	Plump (%)	Protein (%)	Beta-glucan (ppm)
2-row									
AAC Synergy	AAFC	2012	Yes	56	33	5	94	12.2	68
AC Metcalfe	AC	1997	No	56	33	6	87	13.9	119
Conlon	ND	1996	Yes	51	31	7	94	13.4	325
ND Genesis	ND	2015	Yes	55	34	5	95	11.5	221
Pinnacle	ND	2007	Yes	55	33	5	95	11.5	327
6-row									
Lacey	MN	2000	Yes	53	35	3	96	12.5	169
Tradition	ABI	2003	Yes	54	37	3	92	13.4	289
No. of Environments				**12**	**12**	**5**	**5**	**5**	**5**

[1]Abbreviations: Agriculture and Agri-Food Canada (AC and AAFC), North Dakota State University (ND), University of Minnesota (MN) and Anheuser-Busch InBev (ABI).
[2]0-9 scale where 0 = no lodging and 9 = severe lodging.

rust (MCCF). FHB severity and DON can be reduced with fungicides, but they are not always effective. Bacterial leaf streak disease has become more prominent in recent years and tends to become more severe following heavy rain events. This disease cannot be controlled with fungicides. The bacterial leaf streak ratings presented are based on three years of data and at this point show only small differences among varieties for resistance.

PVP Status

All varieties shown in tables except AC Metcalf are covered by the Plant Variety Protection Act, PVP (94). Growers can save seed of these varieties for their own planting only; it cannot be sold to anyone else, not even a relative or a neighbor without specific permission of the applicant for protection.

Authors and Researchers

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Table 2. Disease reactions of barley varieties in multiple year comparisons.

Variety	DON[1]	Barley Yellow Dwarf Virus[1]	Spot Blotch[1]	Stem Rust[1, 2]	Bacterial Leaf Streak[1]
2-row					
AAC Synergy	7	5	2	4	4
AC Metcalfe	5	4	3	3	3
Conlon	3	6	5	3	5
ND Genesis	6	5	3	4	4
Pinnacle	6	6	3	5	4
6-row					
Lacey	8	5	2	4	4
Tradition	6	3	2	3	4
No. of Environments	**5**	**1**	**3**	**4**	**7**

[1]Trait measured on a scale from 0-9 where 0 = resistant and 9 = susceptible. Deoxynivalenol (DON) is the mycotoxin produced by the Fusarium head blight pathogen.
[2]Data is for stem rust pathogen QCCJ. All lines were resistant to stem rust pathogen MCCF in years tested.

Barley Planting Rate and Date

Bushel Weight, Pounds.....48
Seeds/Pound.....14,300
Planting Rate, Pounds/Acre.....85
Planting Rate, Seeds/Sq. Ft.....28
Planting Date.....Early Spring

Table 3. Relative grain yield (percent of the mean of the trial) of barley varieties in northern Minnesota locations in single-year (2019) and multiple year comparisons (2017-2019).

	Crookston		Hallock		Oklee		Perley		Roseau		Stephen		Strathcona	
Variety	2019	3 Yr	2019	3 Yr	2019	3 Yr	2019	3 Yr	2019	3 Yr	2019	3 Yr	2019	3 Yr
2-row														
AAC Synergy	99	99	95	105	98	108	111	107	97	100	94	100	107	102
AC Metcalfe	93	85	98	96	95	93	87	91	100	96	96	95	110	98
Conlon	93	96	94	94	100	93	94	89	95	93	97	96	55	83
ND Genesis	109	102	120	101	108	107	108	100	103	99	103	99	116	106
Pinnacle	108	103	123	109	106	105	74	94	102	108	113	102	114	105
6-row														
Lacey	101	109	100	102	98	98	115	107	106	102	100	106	102	106
Tradition	98	105	70	93	96	95	111	111	97	101	97	103	96	101
Mean	**127**	**131**	**68**	**105**	**85**	**99**	**80**	**100**	**102**	**110**	**117**	**119**	**97**	**108**
LSD 0.05	**8.8**	**6.8**	**37.6**	**12.6**	**7.4**	**14**	**14.2**	**14.7**	**18**	**11.5**	**12.7**	**7.4**	**10.9**	**19.8**

Table 4. Relative grain yield (percent of the mean of the trial) of barley varieties in southern Minnesota locations in single-year (2019) and multiple year comparisons (2017-2019).

	Fergus Falls		Le Center	Morris		Rochester	St. Paul	
Variety	2019	3 Yr	2019[1]	2019	3 Yr	2019[1]	2019	3 Yr
2-row								
AAC Synergy	93	98	111	123	107	102	111	113
AC Metcalfe	52	85	91	91	89	74	82	90
Conlon	81	77	117	36	68	75	53	59
ND Genesis	130	113	107	121	114	105	121	114
Pinnacle	110	110	72	125	110	108	109	100
6-row								
Lacey	107	107	104	112	111	118	117	115
Tradition	126	109	98	106	101	110	107	108
Mean	**41**	**72**	**78**	**66**	**58**	**76**	**59**	**83**
LSD 0.05	**15.2**	**19.6**	**14**	**18**	**9.2**	**11.5**	**8.1**	**6.7**

[1]Trial data is from 2019 only.

Table 5. Relative grain yield (percent of the mean of the trial) of barley varieties in a single-year (2019) and multiple year comparisons (2017-2019).

	State			North			South		
Variety	2019	2 Yr	3 Yr	2019	2 Yr	3 Yr	2019	2 Yr	3 Yr
2-row									
AAC Synergy	103	104	104	100	103	103	109	107	107
AC Metcalfe	91	90	92	97	94	93	80	82	87
Conlon	84	86	87	89	94	92	74	67	73
ND Genesis	111	107	105	109	103	102	115	115	112
Pinnacle	105	105	104	106	105	104	103	105	104
6-row									
Lacey	106	106	106	103	103	104	111	115	111
Tradition	100	102	103	96	99	101	108	110	106
Mean	**83**	**92**	**97**	**96**	**108**	**110**	**64**	**66**	**72**
LSD 0.05	**4.8**	**3.6**	**2.8**	**6.9**	**4.3**	**3.4**	**6.2**	**6.3**	**5.1**
No. of Environments	**12**	**22**	**32**	**7**	**14**	**21**	**5**	**8**	**11**