MCIA SPRING OAT & BARLEY VARIETY TRIAL – 2023 RESULTS

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Michigan State University conducted spring oat and barley variety trials in 2023 with support from the Michigan Crop Improvement Association (MCIA). Locations included Chatham, MI at the MSU Upper Peninsula Research and Extension Center (UPREC) and two commercial farms, Sklarczyk Seed Farm in Johannesburg, MI and the Judge Dairy Farm in Shepherd, MI. Our project included a three-location barley strip trial designed to compare leading genetics for Michigan from field to glass at pilot scale and a national oat variety testing program called the Uniform Early and Mid Oat Performance Nurseries (USDA) in small plots at Chatham only. This research represents an expanded effort to understand oat and barley adaptability and performance in Michigan for both traditional markets and emerging opportunities in craft malting, milling, and distilling.

Temperature was near normal from planting through harvest at all locations. However, precipitation was below normal at Shepherd and Johannesburg until late in the season, when nearly 20 inches of rain fell at Shepherd breaking long-term precipitation records for Isabella County. Wildfire smoke blanketed Michigan for much of the growing season, reucing light intensity. Lodging was observed in oats at Chatham and in barley at Shepherd. Raw grain quality was analyzed at MSU-UPREC, while micro malting and malt quality analysis was conducted by Hartwick College Center for Craft Food and Beverage. Data were analyzed using ANOVA (alpha = 0.05) and Tukey's HSD test in the Agricolae package for R. Statistical analysis was not completed for malt quality data due to removal of the Shepherd location from malting and the resulting small sample size (n=2).

Significant differences were observed among oat varieties for all parameters. Mean yields were 88.2 bu/ac for early oat varieties and 105.3 bu/ac for mid maturity oats. The highest yielding commercial oat varieties producing over 100 bu/ac were Newburg followed by Hayden, Leggett, Buffalo, Ogle, Rushmore, Ida, and Clintland64. Mean test weight was near 38 lbs/bu, and mean protein concentration was near 11% for both nurseries. Mid maturity oats were four inches taller on average than early oats and expereinced slightly more lodging as a result.

Barley performance was highly variable across locations. Drought in May-June followed by excessive precipitation in July-Aug significantly reduced grain yield and quality at Shepherd. Barley yields were above average at Chatham and Johannesburg, despite early season drought conditions. 2ND32529 headed 2-5 days before the other varieties and was severely affected by pre-harvest sprout at all locations. KWS Fantex also succumbed to pre-harvest sprout at the Johannesburg location, but likely due harvest of the trial being delayed until after commercial barley harvest. LCS Genie and Odyssey demonstrated relative dormancy, which protected them from PHS, but also resulted in low germination energy and high Beta-glucan in the malt shortly after harvest. Malt extract was near 82% across all varieties and locations. Malt from 2ND32529 produced hazy wort. Craft maltsters at Great Lakes Malting Company, Mitten State Malt and Emergent Malt will be malting small batches of all four barley varieties from the Chatham and Johannesburg locations to share their observations with the project team and funders.

Dr. DeDecker presented preliminary results of the project at the American Society of Brewing Chemists meeting at Pittsburgh, PA in June 2023. Christian Kapp presented results of the project at the MI Great Beer State Conference at Kalamazoo, MI in Jan 2024 and at the Craft Maltsters Guild Conference at Davis, CA in Feb 2024. We would like to thank MCIA for supporting this research and all our cooperators for making it happen!

TRIAL DETAILS

Design:

RCBD with three replications

Planting date:

Oats: May 11th at Chatham
Barley: May 17th at Chatham
May 10th at Johannesburg
May 5th at Shepherd

Seeded at 28 seeds/ft^2

Fertility:

Oats: 53 lbs N, 60 lbs S per acre as AMS
Barley: 69 lbs N /ac as Urea at Chatham

50 lbs N, 10 lbs P, 50 lbs K, 6 lbs S /ac at Johannesburg

50 lbs N / ac as UAN at Shepherd

Herbicide:

Oats: 2 pt/ac Broclean
Barley: 13.5 oz/ac Huskie at all locations

Fungicide:

Oats: None
Barley: 4 oz/ac Priaxor, plus 13.7 oz/ac Miravis Ace at Chatham

13.7 oz/ac Miravis Ace, plus 8.2 oz/ac Prosaro at Johannesburg

13.6 oz/ac Prosaro PRO at Shepherd

Harvest Date:

Oats: August 30th at Chatham
Barley: Sept. 5th at Chatham
August 27th at Johannesburg
August 30th at Shepherd

SKLARCZYK SEED FARM LLC
GREAT LAKES MALTING COMPANY
MSM
EMERGENT MALT
Upper Peninsula Research and Extension Center MICHIGAN STATE UNIVERSITY
HARTWICK COLLEGE
Center for Craft Food & Beverage
Michigan Crop Improvement Association

Table 1: Early Oat Performance at Chatham, MI (* indicates varieties similar to the **BEST**)						
Variety	**Yield (bu/a @13.5%)**	**TW (lbs/bu)**	**Heading Date**	**Height (in)**	**Lodging (0-5)**	**Protein (%)**
IL15-5271	99.7*	39.5*	7-Jul	22.8	1.3*	10.3
IL15-5752	57.2	40.2*	**30-Jun**	20.5	1.3*	12.0*
IL15-2064	88.2*	40.0*	4-Jul*	22.7	**1.0**	11.2
IL17-3125	111.3*	37.6*	5-Jul*	24.0*	2.0*	11.0
DON (ck)	71.7	38.1*	2-Jul*	17.5	1.0*	12.4*
HA08-03X21-1	112.7*	41.1*	12-Jul	25.7*	1.7*	10.1
CLINTFORD (ck)	73.8	37.6*	3-Jul*	21.0	1.0*	11.4*
A25	52.8	35.7	1-Jul*	24.5*	1.3*	12.1*
A10	61.5	38.6*	2-Jul*	20.2	1.3*	12.0*
A11	71.8	39.9*	6-Jul	19.5	1.0*	11.3*
A513	91.0*	32.8	8-Jul	22.7	1.0*	10.8
A516	54.9	38.2*	1-Jul*	20.2	1.3*	11.6*
A101	76.5	**42.6**	8-Jul	22.7	1.3*	12.1*
MN19114X_012	93.3*	38.1*	9-Jul	25.0*	1.0*	10.6
MN19110X_028	85.3*	39.0*	3-Jul*	22.5	1.0*	10.9
MN20142X_013	97.6*	37.1*	3-Jul*	24.7*	2.7*	11.3*
MN20101X_001	76.9	41.1*	**30-Jun**	18.5	1.7*	11.5*
NATTY (ck)	72.1	39.4*	5-Jul*	29.3*	2.7*	10.2
SD190850	93.1*	41.4*	4-Jul*	29.0*	2.0*	10.4
SD190992	106.5*	38.2*	9-Jul	27.2*	1.7*	9.9
SD200198	97.9*	36.9*	4-Jul*	29.7*	4.0	10.2
SD200326	91.8*	38.1*	2-Jul*	23.3	1.0*	11.0
SD200265	70.2	39.4*	4-Jul*	25.5*	1.0*	11.8*
SD201263	107.5*	37.2*	5-Jul*	26.7*	1.7*	10.6
SD200223	108.3*	39.4*	7-Jul	26.9*	1.0*	9.6
KAME (ck)	75.7	35.3	3-Jul*	23.3	1.3*	10.7
WIX10677-3	96.6*	35.1	8-Jul	27.2*	1.7*	10.8
WIX10680-3	**116.9**	37.3*	11-Jul	26.7*	1.0*	9.6
HAYDEN	105.9*	38.1*	9-Jul	29.5*	1.3*	10.4
ESKER 2020	99.3*	35.7	6-Jul	24.5*	1.3*	10.4
RUSHMORE	100.6*	39.9*	9-Jul	26.0*	1.3*	10.1
BUFFALO	104.8*	36.1	8-Jul	25.5*	1.3*	9.9
Average	**88.2**	**38.3**	**5-Jul**	**24.2**	**1.4**	**10.9**

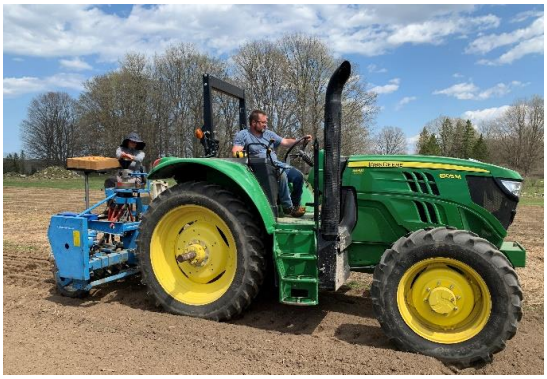

Fig 1. Planting oats at Chatham, MI

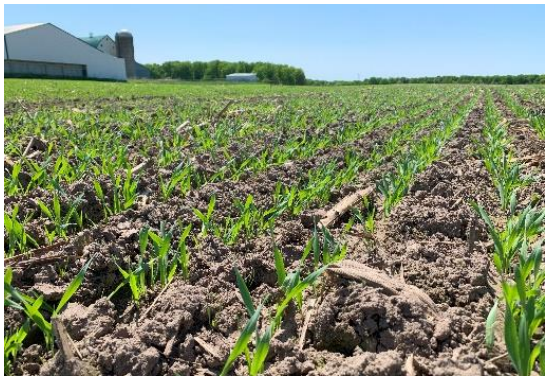

Fig 2. Barley emerging at Johannesburg, MI

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Table 2: Mid Oat Performance at Chatham, MI (*indicates varieties similar to the **BEST**)						
Variety	**Yield (bu/a @13.5%)**	**TW (lbs/bu)**	**Heading Date**	**Height (in)**	**Lodging (0-5)**	**Protein (%)**
OGLE (ck)	103.6*	33.2	6-Jul	25.2	**1.0**	11.1
IL17-1704	113.5*	38.7*	5-Jul	25.7	4.0	10.8
IL17-1253	115.0*	38.3*	9-Jul	24.0	1.0*	11.2
IL16-9239	83.6	36.7*	3-Jul*	21.3	1.0*	12.1*
IL18-735	95.1*	34.9*	4-Jul*	23.0	1.0*	11.9*
CLINTLAND64 (ck)	100.2*	36.3*	2-Jul*	23.5	1.0*	11.6
SD200048	104.0*	**41.2**	8-Jul	31.7*	2.0*	10.9
SD201631	119.7*	37.8*	7-Jul	24.8	1.0*	10.5
SD201374	108.0*	36.1*	7-Jul	31.5*	1.2*	9.9
SD201026	108.0*	38.7*	9-Jul	32.8*	3.8	11.1
SD201470	120.9*	37.7*	11-Jul	27.8	1.0*	10.2
SD200625	114.0*	40.0*	7-Jul	25.3	2.7	10.4
GOPHER (ck)	82.7	36.6*	8-Jul	32.3*	2.2*	11.7
MN20142X_001	98.2*	37.2*	4-Jul*	26.8	1.0*	10.7
MN20117X_011	115.2*	38.3*	8-Jul	27.0	1.0*	10.9
MN20124X_020	99.0*	37.6*	8-Jul	27.7	2.8	11.4
MN20107X_004	106.6*	37.9*	8-Jul	30.5	1.2*	10.8
NEWBURG (ck)	110.5*	37.9*	9-Jul	27.8	1.3*	11.4
ND170376	103.2*	37.7*	11-Jul	35.0*	2.0*	10.9
ND170395	106.9*	40.8*	8-Jul	31.5*	2.0*	10.8
ND170388	104.4*	37.9*	9-Jul	27.0	2.0*	10.9
ND190346	114.6*	39.7*	8-Jul	29.7	3.3	10.8
ND190516	99.2*	36.6*	10-Jul	29.3	3.3	10.8
ND200208	115.7*	38.8*	11-Jul	35.3*	1.3*	10.6
ND200234	90.3	33.4	11-Jul	**35.5***	4.5	10.7
WIX10710-5	123.1*	37.6*	11-Jul	27.5	1.0*	10.8
WIX10466-7	112.5*	37.6*	9-Jul	30.2	1.7*	10.6
WIX10642-3	91.2	37.4*	8-Jul	28.5	1.7*	11.3
WIX10710-7	109.2*	39.2*	13-Jul	25.0	1.0*	11.6
LEGGETT (ck)	105.5*	37.3*	9-Jul	29.0	1.0*	11.1
OT2139	114.5*	37.7*	13-Jul	25.8	1.0*	10.8
OT3116	**124.1***	40.9*	14-Jul	30.5	1.0*	10.1
IDA	100.5*	37.6*	6-Jul	29.8	1.3*	11.1
MINK	67.9	39.0*	**1-Jul**	18.7	1.0*	**12.7**
Average	**105.3**	**37.8**	**8-Jul**	**28.2**	**1.7**	**11.0**

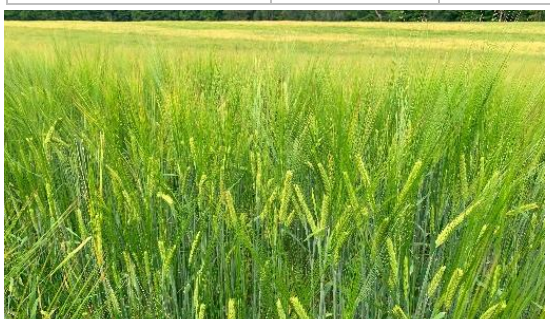

Fig 3. Barley headed at Chatham, MI

Fig 4. Barley ripening at Chatham, MI

Table 3: Barley Yield and Grain Quality Across Locations (*indicates varieties similar to the **BEST**)											
Location	**Variety**	**Yield (bu/ac)**	**Heading Date**	**Height (in)**	**Protein (%)**	**Plump (%)**	**Thin (%)**	**Germ Energy 4ml (%)**	**Germ Capacity (%)**	**RVU**	**DON (ppm)**
Chatham	2ND32529	109.3	7-Jul	31.0	11.3	99.5	0.1	88	98	10	0.3
Chatham	KWS Fantex	124.2	12-Jul	22.0	11.5	98.6	0.3	81	95	136	0.4
Chatham	LCS Genie	118.4	12-Jul	26.0	11.2	98.7	0.1	54	91	152	0.3
Chatham	LCS Odyssey	119.5	12-Jul	27.0	11.0	99.1	0.1	46	90	144	0.2
Chatham	**Average**	**117.9**	**10-Jul**	**26.5**	**11.3**	**99.0**	**0.2**	**67.3**	**93.5**	**111**	**0.3**
Johannesburg	2ND32529	110.3	5-Jul	23.7	10.5	95.7	0.7	55	55	7	0.4
Johannesburg	KWS Fantex	107.3	7-Jul	16.2	10.1	96.1	0.4	86	91	71	0.5
Johannesburg	LCS Genie	100.6	7-Jul	17.8	10.1	97.0	0.3	35	91	111	0.3
Johannesburg	LCS Odyssey	113.0	7-Jul	19.3	9.8	95.9	0.6	53	95	113	0.4
Johannesburg	**Average**	**107.8**	**6-Jul**	**19.3**	**10.1**	**96.2**	**0.5**	**57.3**	**83.0**	**76**	**0.4**
Shepherd	2ND32529	41.3	2-Jul	NA	11.9	95.5	0.4	74	90	4	0.6
Shepherd	KWS Fantex	20.0	30-Jun	NA	13.6	95.7	0.4	91	95	23	0.3
Shepherd	LCS Genie	32.3	25-Jun	NA	13.0	93.5	0.6	93	95	53	0.3
Shepherd	LCS Odyssey	27.0	25-Jun	NA	12.8	96.4	0.4	91	92	21	0.3
Shepherd	**Average**	**30.2**	**28-Jun**	**NA**	**12.8**	**95.3**	**0.5**	**87.3**	**93.0**	**25**	**0.4**
Average	**2ND32529**	**87.0**	**4-Jul**	**25.9**	11.2*	96.9*	0.4*	72.3*	81.0*	7	0.5*
Average	**KWS Fantex**	83.8*	6-Jul*	18.3	11.7*	96.8*	0.4*	**86.0**	**93.7**	77*	0.4*
Average	**LCS Genie**	83.8*	4-Jul*	20.4	11.4*	96.4*	**0.3**	60.7*	92.3*	**105**	0.3*
Average	**LCS Odyssey**	86.5*	4-Jul*	21.2	**11.2**	**97.1**	0.4*	63.3*	92.3*	93*	**0.3**
Average	**Average**	**85.3**	**5-Jul**	**22.9**	**11.4**	**96.8**	**0.4**	**70.6**	**89.8**	**70**	**0.3**

Table 4: Barley Malt Quality Across Locations (no significant differences)											
Location	**Variety**	**Extract (%)**	**Color (SRM)**	**β-glucan (mg/L)**	**Soluble Protein (%)**	**S/T (%)**	**FAN (mg/L)**	**Diastatic Power (L)**	**Alpha Amylase (DU)**	**Clarity**	**pH**
Chatham	2ND32529	81.0	2.0	811	4.7	39.7	199	79	29.8	Sl.Hazy	5.5
Chatham	KWS Fantex	81.5	1.9	960	4.5	37.9	201	89	39.1	Clear	5.8
Chatham	LCS Genie	82.0	2.0	822	4.7	38.2	203	104	40.5	Clear	5.7
Chatham	LCS Odyssey	81.8	1.7	965	4.2	34.8	176	80	38.4	Clear	5.8
Chatham	**Average**	**81.6**	**1.9**	**889.5**	**4.5**	**37.7**	**194.8**	**88.0**	**37.0**	**Clear**	**5.7**
Johannesburg	2ND32529	81.1	2.8	532	4.7	40.3	205	65	28.7	Hazy	5.5
Johannesburg	KWS Fantex	82.5	2.0	461	4.6	40.7	215	88	49.9	Clear	5.6
Johannesburg	LCS Genie	82.9	1.9	304	4.8	44.7	207	114	48.4	Clear	5.7
Johannesburg	LCS Odyssey	82.9	2.0	316	4.8	43.4	211	94	55.6	Clear	5.7
Johannesburg	**Average**	**82.4**	**2.2**	**403.3**	**4.7**	**42.3**	**209.5**	**90.3**	**45.7**	**Clear**	**5.6**
Average	**2ND32529**	81.1	2.4	671.5	4.7	40.0	202.0	72.0	29.3	Sl.Hazy	5.5
Average	**KWS Fantex**	82.0	2.0	710.5	4.5	39.3	208.0	88.5	44.5	Clear	5.7
Average	**LCS Genie**	82.5	2.0	563.0	4.7	41.5	205.0	109.0	44.5	Clear	5.7
Average	**LCS Odyssey**	82.4	1.8	640.5	4.5	39.1	193.5	87.0	47.0	Clear	5.7
Average	**Average**	**82.0**	**2.1**	**646.4**	**4.6**	**40.0**	**202.1**	**89.1**	**41.3**	**Clear**	**5.7**