Oat Variety Trial in Northeast Iowa

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Introduction

Oats are a major spring-sown, small grain crop in Iowa. It can be used for grain and straw production, as a companion crop to establish hay and pastures, or for early-season forage as hay or haylage. Because oats mature in late July to early August, it allows for cropping options for the remainder of the season including establishment of perennial forage or cover crops, and a timely window for a mid-season animal manure application.

Careful management and proper choice of variety can make oats a profitable crop due to their low input requirements and favorable effects on succeeding crops in a rotation. Planting oats before April 15 is recommended for optimal yields in Iowa. This helps avoid exposure to warmer weather during grain fill.

Test weight is the most commonly used indicator of grain quality. High test-weight varieties should be chosen by growers who intend to market oat grain. Grain quality components such as Beta glucans and fat also are gaining importance by food processors. Beta glucans are noteworthy for positive effects on human health. Grain with lower fat concentration tends to store better, reducing the potential for grain rancidity.

Oat growth in Iowa is regularly affected by rust and barley yellow dwarf virus. Variety resistance to these diseases should be considered.

Another option is to use a foliar fungicide applied at Feekes 9 growth stage, defined as flag leaf emerged and ligule visible.

Materials and Methods

Sixteen oat varieties were tested in 2018. The soils at the site consist of 84 Clyde silty clay loam and 198B Floyd loam. The site was in soybean the previous year and has been in a corn-soybean crop rotation for over 20 years. In fall, the site was fertilized with 13 lb N/acre and 65 lb P_2O_5/acre as monoammonium phosphate (MAP), and 150 lb K_2O/acre. On March 22, the site was fertilized with 16 lb N/acre as urea, 16 lb P_2O_5/acre as Triple super phosphate, and 70 lb K_2O/acre to meet recommendations based on soil test levels.

On April 24, the site was field cultivated, and then again April 25 in the opposite direction to spread soybean residue. The oats were planted April 25 at four bushels/acre. The planter was a John Deere BD1108 drill with 7.5-in. row spacing. On April 30, the site received a pass with a cultipacker. Both Esker and Ron were slow to emerge, however, these also were the only two varieties with a seed treatment. Each plot of a variety occupied 731 sq ft and there were four replications. The trial was sufficiently weed-free and did not require the use of herbicides or hand weeding.

The trial was harvested July 24 with a JD4420 combine with Avery Weigh-Tronix load cells on weigh bin. Straw yields were determined from 8.125-ft wide by 20-ft long windrows from the center of each plot. Subsamples were collected and dried for percent dry matter determination.

The 2018 weather delayed planting due to snow cover and 32^{o}F soil temperatures up to the third week in April. May and June weather

had above normal precipitation and growing degree days (GDD), while July was drier with normal GDD (Table 1).

Results and Discussion

Oat growth is regularly affected by rust and barley yellow dwarf virus. Diseases were evaluated June 28 and rated on a 0 to 9 scale (Table 2). Yield results are provided in Table 3 and reported on a 32 lb/bushel basis. Test weight is the most important indicator of grain milling quality. Minimum test weights are 36 lb/bushel for U.S. No. 1 oats, and 33 lb/bushel for U.S. No. 2 oats.

The percent lodging at harvest in Table 3 may be more severe than what farmers would experience, because this trial delays harvest until standing crop grain moisture is around 13 percent compared with cutting earlier and windrowing to dry to 13 percent for harvest.

Yield results from a single year are not reliable predictors of next year's yield. Environment and disease can fluctuate greatly from year to year, so it is important to consider yields averaged over multiple years.

Table 4 provides a summary of yield and test weight for individual and multi-year averages of trials conducted from 2011–2017. Complete reports for 2011–2017 oat variety trials are at: http://farms.ag.iastate.edu/content/northeast-research-and-demonstration-farm

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Table 1. Rainfall and oat growing degree days (GDD) for 2018 and the long-term normal.

	Rainfall, in.		GDD, base 32°F	
Month	2018	Normal	2018	Normal
April	2.81	3.79	270	498
May	6.26	4.40	1,058	823
June	9.73	5.63	1,207	1,098
July	2.90	4.78	1,184	1,250
Total	21.70	18.60	3,748	3,669

Table 2. State of origin, PVP[a] and disease ratings[c] for oat varieties included in the 2018 variety trial at the ISU Northeast Research and Demonstration Farm, Nashua.

				Disease name and disease rating[c] on June 28			
Variety	**State of origin[a]**	**PVP[b]**	**Maturity**	**Crown rust**	**Stem rust**	**BYDV[d]**	**Septoria**
Antigo	WI	PVP	Early	0.33	0.00	1.67	2.00
BetaGene^{TM}	WI	PVP	Early-mid	0.00	0.00	1.00	1.33
Camden	Canada	PVP	Late	1.33	0.00	1.67	1.00
Deon	MN	PVP	Late	0.00	0.00	1.00	1.00
Esker	SD	PVP	Early	1.00	0.00	1.00	1.33
Hayden	SD	PVP	Mid-late	1.00	0.00	1.33	1.67
Horsepower	SD	PVP	Early-mid	3.67	0.00	2.33	1.00
Jerry	ND	PVP	Mid-late	2.00	0.00	1.67	2.67
MN Pearl	MN	PVP	Mid	0.33	0.00	1.33	1.67
Natty	SD	PVP	Early-mid	1.33	0.00	1.00	1.00
Ron	WI	PVP	Mid	0.33	0.33	1.00	1.67
Reins	IL	PVP	Early	2.00	0.33	1.00	1.33
Saber	IL	PVP	Early	1.00	0.00	1.67	1.67
Saddle	SD	PVP	Early	0.00	0.00	1.00	1.33
Shelby 427	SD	PVP	Early-mid	1.00	0.33	1.00	1.00
Sumo	SD	PVP	Early	0.50	0.00	1.00	1.00

[a]Origin: AAFC = Agriculture and Agri-Food Canada; IL = University of Illinois, MN = University of Minnesota; ND = North Dakota State University; SD = South Dakota State University; WI = University of Wisconsin.

[b]PVP = Plant Variety Protection. The PVP Act provides a certificate to the developer of a variety granting exclusive rights for reproducing and marketing the seed.

[c]Disease rating on a 0-9 scale: 0 = no disease presence; 9 = dead.

[d]BYDV = Barley yellow dwarf virus.

Table 3. Performance of 16 oat varieties tested in 2018 at the ISU Northeast Research and Demonstration Farm, Nashua.

Variety	Grain yield[a] July 24 (bu/ac)	Grain moisture (%)	Test weight (lb/bu)	% Heading June 18 (%)	Plant height at harvest (in.)	% Lodging at harvest (%)	Straw yield July 25 (DM ton/ac)
Antigo	78.9	12.2	34.5	95	32	28	0.99
BetaGene™	90.7	11.7	31.1	77	36	7	1.19
Camden	96.1	11.2	29.8	13	34	6	1.07
Deon	108.7	12.9	33.1	7	39	1	1.63
Esker	89.9	11.9	31.3	77	36	1	1.24
Hayden	101.4	12.5	34.5	62	36	6	1.42
Horsepower	70.1	12.1	32.8	90	32	77	0.85
Jerry	80.1	11.9	32.0	50	38	52	1.19
MN Pearl	97.2	12.8	33.8	8	36	1	1.21
Natty	97.8	12.6	34.0	90	38	3	1.59
Ron	101.4	11.9	31.9	23	36	1	1.68
Reins	89.8	12.5	34.1	95	27	3	0.90
Saber	85.4	12.2	33.1	95	33	1	1.17
Saddle	86.1	12.9	32.8	95	34	0	1.57
Shelby 427	81.2	12.4	34.1	95	37	3	1.45
Sumo	85.8	13.5	34.0	95	33	1	1.52
Average	90.0	12.3	32.9	67	35	12	1.29
LSD[b] 0.05	12.4	1.2	1.6	- -	3	30	0.38

Table 4. Individual and multi-year summaries of oat variety trial results at the ISU Northeast Research and Demonstration Farm, Nashua, 2014-2017

	2014		2015		2016		2017		2014-2016 avg.		2015-2017 avg.	
Variety	yield	test wt	yield	test wt	yield	test wt	yield	test wt.	yield	test wt	yield	test wt.
	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu
Antigo	- -	- -	- -	- -	- -	- -	97.8	37.7	- -	- -	- -	- -
Badger	93.6	27.3	136.7	32.3	127.1	32.0	- -	- -	119.1	30.5	- -	- -
BetaGene™	- -	- -	145.1	33.0	135.6	33.0	115.6	32.8	- -	- -	132.2	32.9
Deon	104.5	30.7	139.6	35.2	140.5	35.0	126.8	34.7	128.2	33.6	135.9	35.0
Excel	82.9	27.2	145.8	33.4	130.7	32.5	- -	- -	119.8	31.0	- -	- -
GM423	- -	- -	135.8	31.9	135.6	31.9	- -	- -	- -	- -	- -	- -
Goliath	98.8	31.6	137.5	36.1	132.2	36.2	118.8	35.6	122.8	34.6	129.5	36.1
Hayden	92.2	30.7	151.6	36.3	132.1	35.4	128.9	36.3	125.3	34.1	137.6	36.0
Horsepower	78.3	27.8	131.6	35.0	116.0	34.0	119.5	35.3	108.6	32.3	122.4	34.8
Jerry	79.7	29.3	129.1	35.7	114.8	33.8	94.0	35.1	107.9	32.9	112.7	34.9
Leggett	- -	- -	141.4	33.8	127.1	33.5	117.4	33.5	- -	- -	128.7	33.6
Natty	97.2	29.8	138.6	36.5	129.3	35.1	119.6	35.3	121.7	33.8	129.2	35.6
Reins	- -	- -	- -	- -	- -	- -	109.8	36.3	- -	- -	- -	- -
Rockford	- -	- -	123.3	36.2	131.4	35.2	100.8	34.8	- -	- -	118.5	35.4
Saber	102.2	30.2	151.7	33.6	135.7	33.6	121.8	34.3	129.9	32.5	136.4	33.8
Shelby 427	82.7	30.3	137.5	35.5	114.5	34.7	102.2	36.3	111.6	33.5	118.1	35.5
Souris	- -	- -	127.8	33.3	121.0	33.0	116.0	33.4	- -	- -	121.6	33.3
Sumo	- -	- -	- -	- -	- -	- -	104.0	36.1	- -	- -	- -	- -
Tack	- -	- -	125.6	36.2	116.5	35.2	- -	- -	- -	- -	- -	- -
Average	81.5	29.5	137.4	34.6	137.4	34.6	112.9	35.2	119.5	32.9	126.9	34.7
LSD[b] 0.05	7.0	1.1	8.6	0.9	15.1	1.1	15.0	0.6	- -	- -	- -	- -

[a]Grain yield are based on 32 lb/bushel test weight.

[b]LSD = least significant difference. Entries that differ by one LSD or more are considered to be in different classes with 95 percent certainty.