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Oat Variety Trial in Northeast Iowa

RFR-A1687

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Introduction

Oats are a major spring-sown, small grain crop in Iowa. Oats 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 the use of a foliar fungicide applied at Feekes 9 growth stage, defined as flag leaf emerged with ligule visible.

Materials and Methods

Sixteen oat varieties were tested in 2016. The soils at the site consist of 84 Clyde silty clay loam and 198B Floyd loam. The site was in soybeans the previous year and has been in a corn-soybean crop rotation for over 20 years. The site was fertilized with 11 lb N/acre, 52 lb P₂O₅/acre, and 91 lb K₂O/acre to meet optimal soil test levels based on ISU soil fertility recommendations.

The site was field cultivated March 29 and again April 3 in the opposite direction to spread crop residue. The oats were planted April 4 at four bushels/acre. The planter was a John Deere BD1108 drill with 7.5-in. row spacing. Each plot of a variety occupied 552.5 sq. ft and there were three replications. The trial was sufficiently weed-free to not require the use of herbicides or hand weeding.

The trial was harvested July 26 with a JD4420 combine with Weigh-Tronix load cells on the 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 2016 season weather had near normal growing degree days, a dry spring, and a very wet June (Table 1).

Results and Discussion

Oat growth is regularly affected by rust and barley yellow dwarf virus. Diseases were evaluated July 1 and rated on a 1 to 10 scale (Table 2). Yield results are provided in Table 3. Yields are 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.

Yield results from a single year are not reliable predictors of next year's yield. Environment and disease conditions 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 or multi-year averages of trials conducted from 2011-2016.

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Table 1. Rainfall and oat growing degree days (GDD) for 2016 and the long-term normal.

Month	Rainfall, inches		GDD, base 32°F	
	2016	Normal	2016	Normal
April	2.3	3.9	562	498
May	3.0	4.4	877	823
June	11.6	5.4	1,169	1,098
July	6.1	4.8	1,238	1,250
Total	23.0	18.5	3,846	3,669

Table 2. State of origin, PVP^a and disease ratings^c for oat varieties included in the 2016 variety trial at the ISU Northeast Research and Demonstration Farm, Nashua.

Variety	State of origin ^a	PVP ^b	Maturity	Disease name and disease rating by variety (1-10 scale) ^c		
				Crown rust	Stem rust	Other diseases
Badger	WI	PVP	Early	3.3	0	4.3
BetaGene	WI	PVP	Mid-Late	1.7	0	2.7
Deon	MN	PVP	Late	1.0	0	1.7
Excel	IN	PVP	Early	3.0	0	2.7
Goliath	SD	PVP	Late	2.3	0	2.0
Hayden	SD	PVP	Medium	3.0	0	2.7
Horsepower	SD	PVP	Medium	3.7	0	2.7
Jerry	ND	PVP	Medium	3.7	0	4.0
Leggett	AAFC	PVP	Early	2.7	0	3.3
Natty	SD	PVP	Medium	1.7	0	2.7
Reins	IL	PVP	Early	2.7	0	2.3
Rockford	ND	PVP	Late	3.7	0	2.7
Saber	IL	PVP	Early	4.0	0	3.3
Shelby 427	SD	PVP	Medium	3.3	0	3.0
Souris	ND	PVP	Mid-Late	4.3	0	3.3
Tack	IL	PVP	Early	3.0	0	2.0

^aOrigin: AAFC = Agriculture and Agri-Food Canada; IL = University of Illinois, IN = Purdue University; MN = University of Minnesota; ND = North Dakota State University; SD = South Dakota State University; WI = University of Wisconsin.

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

^cDisease rating on a 1-10 scale: 1 = no disease presence; 10 = heavy disease presence

Table 3. Performance of 16 oat varieties tested in 2016 at the ISU Northeast Research and Demonstration Farm, Nashua.

Variety	Grain yield ^a	Grain	Test	% Heading	Maturity ^b	Plant height	% Lodging	Straw yield
	July 26 bu/ac	moisture %	weight lb/bu	June 15 %	July 1 %	July 26 inches	July 26 %	July 27 DM ton/ac
Badger	127	13.5	32	95	LM	35	53	1.1
BetaGene	136	13.6	33	93	LM	39	2	1.4
Deon	140	13.2	35	47	MM	41	0	1.8
Excel	131	13.0	32	93	LM	37	22	1.3
Goliath	132	13.4	36	36	MM	47	8	1.7
Hayden	132	13.6	35	90	LM	38	3	1.6
Horsepower	116	12.9	34	93	LM	33	15	1.3
Jerry	115	13.1	34	95	LM	41	5	1.5
Leggett	127	13.2	33	80	LM	38	5	1.5
Natty	129	13.1	35	95	LM	42	2	1.7
Reins	116	13.1	35	95	LM/ED	32	3	0.9
Rockford	131	13.0	35	77	MM	44	27	1.7
Saber	136	13.1	34	95	LM	36	2	1.2
Shelby 427	115	12.6	35	95	LM/ED	41	6	1.5
Souris	121	12.8	33	90	LM	36	8	1.4
Tack	116	13.2	35	95	ED	35	10	1.3
Average	126	13.2	34	--	--	38	11	1.4
LSD ^c 0.05	26	1.1	1	--	--	4	21	0.4

^aGrain yields are based on 32 lb/bushel test weight.

^bMaturity rating on July 1: MM = mid-milk stage, LM = late milk stage, ED = early dough stage

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

Table 4. Individual and multi-year summaries of oat variety trial results at the ISU Northeast Research and Demonstration Farm, Nashua, 2011-2016^a

Variety	2011 - 2013 avg		2014		2015		2015-2016 avg		2014-2016 avg	
	yield bu/ac	test wt lb/bu	yield bu/ac	test wt lb/bu	yield bu/ac	test wt lb/bu	yield bu/ac	test wt lb/bu	yield bu/ac	test wt lb/bu
Badger	--	--	93.6	27.3	136.7	32.3	131.9	32.2	119.1	30.5
Betagene	--	--	--	--	145.1	33.0	140.4	33.0	--	--
Deon	--	--	104.5	30.7	139.6	35.2	140.1	35.1	128.2	33.6
Excel	95	32.2	82.9	27.2	145.8	33.4	138.3	33.0	119.8	31.0
GM423	--	--	--	--	135.8	31.9	--	--	--	--
Goliath	--	--	98.8	31.6	137.5	36.1	134.9	36.2	122.8	34.6
Hayden	--	--	92.2	30.7	151.6	36.3	141.9	35.9	125.3	34.1
Horsepower	101	35.6	78.3	27.8	131.6	35.0	123.8	34.5	108.6	32.3
Jerry	92	34.3	79.7	29.3	129.1	35.7	122.0	34.8	107.9	32.9
Leggett	--	--	--	--	141.4	33.8	134.3	33.7	--	--
Natty	--	--	97.2	29.8	138.6	36.5	134.0	35.8	121.7	33.8
Rockford	--	--	--	--	123.3	36.2	127.4	35.7	--	--
Saber	100	33.4	102.2	30.2	151.7	33.6	143.7	33.6	129.9	32.5
Shelby 427	97	35.1	82.7	30.3	137.5	35.5	126.0	35.1	111.6	33.5
Souris	--	--	--	--	127.8	33.3	124.4	33.2	--	--
Tack	91	34.7	--	--	125.6	36.2	121.1	35.7	--	--
Average	97	34.2	81.5	29.5	137.4	34.6	132.3	34.5	119.5	32.9
LSD 0.05	7	0.6	7.0	1.1	8.6	0.9	15.1	1.1	13.4	1.0

^aComplete reports for the 2011-2015 Oat Variety Trials are available at: <http://farms.ag.iastate.edu/content/northeast-research-and-demonstration-farm>.

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