

Oat Variety Trial in Northeast Iowa

RFR-A1581

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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 a perennial forage or cover crop, and 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. Lower fat concentration in grain tends to store better, reducing the potential for grain rancidity.

Oat growth 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. A separate oat trial was conducted this season to compare the use of a foliar fungicide.

Materials and Methods

Sixteen oat varieties were tested in 2015. The soils at the site consist of 83B Kenyon 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 18 lb N/acre and 35 lb K₂O/acre to meet optimal soil test levels based on ISU soil fertility recommendations.

The site was field cultivated once before planting on April 1. The planter was a John Deere BD1108 drill with 7.5-in. row spacing planted at a rate of four bushels/acre followed by one pass with a cultipacker. Each plot of a variety occupied 553 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 23 with a JD4420 combine with Weigh-Tronix load cells on weigh bin. Subsamples of grain were analyzed by General Mills for percent groats, plump groats, beta glucans, and fat.

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 2015 season provided normal growing degree days and precipitation (Table 1).

Results and Discussion

Variety trial results for 2015 are presented in Table 3. Yields reported are 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.

Some of the grain quality components are included in Table 3. Higher concentrations of groats, plump groats, and beta glucans, and lower concentrations of fat are more favorable to the oat food processing companies.

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 varieties in trials conducted from 2011-2015.

Acknowledgements

Thanks to General Mills, Albert Lee Seed House, Melanie Caffé of South Dakota State University, Practical Farmers of Iowa, Grain Millers, and the Sustainable Food Lab.

Table 1. Rainfall and oat growing degree days (GDD) for 2015 and the long-term normal.

Month	Rainfall, in.		GDD, base 32°F	
	2015	Normal	2015	Normal
April	4.3	3.8	519	498
May	3.5	4.4	867	823
June	5.8	5.3	1,099	1,098
July	4.0	4.7	1,185	1,250
Total	17.6	18.2	3,670	3,669

Table 2. State of origin, PVP^a and disease ratings^b for oat varieties included in the 2015 variety trial at the ISU Northeast Research and Demonstration Farm, Nashua.

Variety	State of origin ^a	PVP ^b	Maturity	Disease name and disease ratings ^c by variety			
				Crown rust	Stem rust	BYDV ^d	Smut
Badger	WI	PVP	Early	MR	MS	MR	R
BetaGene	WI	PVP	Mid-Late	MR	MR	R	R
Deon	MN	PVP	Late	MR	MS	MR	R
Excel	IN	PVP	Early	MS	S	R	MR
GM423	GM	PVP	Late	MS	MS	MR	- -
Goliath	SD	PVP	Late	MS	R	MR	MR
Hayden	SD	PVP	Mid-Late	MS	MS	MR	R
Horsepower	SD	PVP	Medium	MS	MS	MS	MR
Jerry	ND	PVP	Medium	MS	MS	MS	MS
Leggett	AAFC	PVP	Early	MR	MR	S	R
Natty	SD	PVP	Medium	MR	MS	MR	R
Rockford	ND	PVP	Late	MS	MS	MR	MR
Saber	IL	PVP	Early	MS	S	R	MS
Shelby 427	SD	PVP	Medium	MS	MS	MR	MR
Souris	ND	PVP	Medium	S	MS	MS	MR
Tack	IL	PVP	Early	R	S	R	S

^aOrigin: AAFC = Agriculture and Agri-Food Canada; GM = General Mills; 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 ratings: S = susceptible; MS = moderately susceptible; MR = moderately resistant; R = resistant.

^dDisease: BYDV = barley yellow dwarf virus.

Table 3. Performance of 16 oat varieties tested in 2015 at the ISU Northeast Research and Demonstration Farm, Nashua.

Variety	Grain yield ^a	Grain	Test	Heading	Mature	Plant height	Lodging	Straw yield	Groats	Plump groats	Beta glucans	Fat
	July 23	moisture	weight	June 12	July 2	July 23	July 23	July 25				
	(bu/ac)	(%)	(lb/bu)	(%)	(%)	(in.)	(%)	(tons/ac)	(%)	(%)	(%)	(%)
Badger	137	13.5	32	98	15	31	32	1.1	68	50	5.3	7.0
BetaGene	145	13.4	33	93	13	36	3	1.7	67	56	5.9	6.8
Deon	140	13.9	35	27	1	37	0	2.5	70	43	4.6	8.2
Excel	146	12.8	33	95	18	36	2	1.6	66	46	4.6	7.0
GM423	136	13.5	32	10	1	40	2	2.1	69	47	6.2	7.7
Goliath	137	13.8	36	18	1	47	3	2.6	70	50	5.0	7.3
Hayden	152	13.2	36	67	8	39	1	2.0	71	56	4.9	8.3
Horsepower	132	13.1	35	95	13	36	17	1.3	68	41	5.0	7.6
Jerry	129	12.7	36	95	27	37	53	1.5	69	47	4.6	7.4
Leggett	141	13.6	34	50	12	36	3	1.9	68	40	4.8	7.5
Natty	139	13.1	37	100	23	40	0	1.7	69	49	4.8	6.3
Rockford	123	13.7	36	20	2	39	1	2.0	71	42	4.7	8.8
Saber	152	13.0	34	100	30	34	1	1.5	72	36	4.8	7.0
Shelby 427	137	13.2	35	100	27	39	4	1.7	70	46	4.9	7.7
Souris	128	13.0	33	67	18	36	17	1.4	69	31	4.8	7.3
Tack	126	13.0	36	100	38	33	35	1.4	72	42	4.4	8.6
Average	138	13.3	35	--	--	38	11	1.8	69	45	5.0	7.5
LSD ^b 0.05	21	1.0	1	--	--	2	24	0.4	2	7	0.7	0.4

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

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

Table 4. Individual and multi-year summaries of oat variety trial results at the ISU Northeast Research and Demonstration Farm, Nashua, 2011-2015.^a

Variety	2011		2012		2013		2011 - 2013 avg.		2014		2014-2015 avg.	
	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)
Badger	--	--	--	--	--	--	--	--	93.6	27.3	115.2	29.8
Deon	--	--	--	--	--	--	--	--	104.5	30.7	122.1	33.0
Excel	111	29.8	75	33.5	99	33.4	95	32.2	82.9	27.2	114.4	30.2
Goliath	--	--	--	--	97	35.4	--	--	98.8	31.6	118.2	33.8
Hayden	--	--	--	--	--	--	--	--	92.2	30.7	121.9	33.4
Horsepower	105	34.7	99	36.6	99	35.4	101	35.6	78.3	27.8	105.0	31.4
Jerry	93	31.7	97	36.3	87	34.8	92	34.3	79.7	29.3	104.4	32.5
Natty	--	--	--	--	--	--	--	--	97.2	29.8	117.9	33.2
Saber	113	30.6	86	34.7	100	35.0	100	33.4	102.2	30.2	127.0	31.9
Shelby 427	106	33.4	98	37.0	87	34.8	97	35.1	82.7	30.3	110.1	32.9
Tack	99	34.1	81	34.7	93	35.4	91	34.7	--	--	--	--
Average	105	32.4	89	35.5	95	34.9	97	34.2	81.5	29.5	115.6	32.2
LSD 0.05	11	0.6	13	0.9	13	2.3	7	0.6	7.0	1.1	9.3	1.0

^aComplete reports for the 2011, 2012, 2013, and 2014 Oat Variety Trials are available at: http://www.ag.iastate.edu/farms/progress_report.php

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