



Oat Variety Trials 2016

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Funding by:

This project is supported in part by

Walton Family Foundation

General Mills

Grain Millers, Inc.

Albert Lea Seed House

Sustainable Food Lab

In a Nutshell

- Small grain crops, like oats, are seeing renewed interest by farmers in Iowa. Iowa was once a nationwide leader in oats production, but many farm families have not grown them for a generation or two.
- 16 oat varieties were screened at two Iowa State University research farms and one commercial farm.

Key findings

- Saber, Reins, Betagene, Deon, Badger and Excel varieties were among the top performers in terms of yield at locations.
- Reins and Shelby 427 at Kanawha met the test weight requirement (38 lb/bu) identified by food processors.

Project Timeline:

2015-16

Background

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 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



Oat variety trials at Wendy Johnson's farm near Charles City. Photo courtesy of Wendy Johnson, taken on May 18, 2016.

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. Additionally, the concentration of Beta glucans in the grain, noteworthy for its positive effects on health, is considered by food processors. Fat concentration is also considered for storage purposes with low concentrations reducing the potential for grain rancidity and increasing shelf life.

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.

Methods

Variety trials were conducted at three locations in 2016—ISU Northern Research Farm in Kanawha; ISU Northeast Research Farm in Nashua; Wendy Johnson farm in Charles City. These trials build on the varieties screened at Kanawha and Nashua in 2015 (Gailans et al., 2015). Information about each of the varieties included in 2016 can be found in **Table 1**.

Table 1

State of origin, PVP and disease ratings for oat varieties included in 2016.

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
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
Reins	IL	PVP	Early	MR	MR	R	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

^a Origin: 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.

^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 Ratings: S = susceptible; MS = moderately susceptible; MR = moderately resistant; R = resistant.

^d Disease: BYDV = Barley Yellow Dwarf Virus.

At each location, oat varieties were seeded in small research plots (552.5 ft²) and replicated three times. A seeding rate of 128 lb/ac and row spacing of 7.5 inches, followed by cultipacking, was used at all locations. Seeding depth was 1 inch. Dates of field operations for both experiments are listed in **Table 2**. No herbicides, fungicides or insecticides were applied at any location. Entries were screened for crown rust incidence at locations using a numeric scale (1=low, 9=high) in early July. Plots were harvested at Kanawha and Charles City with a Wintersteiger plot combine,

cylinder speed at 1,450 RPM, concave set to 900 rpm and move sieves to high position; and at Nashua with a JD4420 combine with Weigh-Tronix load cells on weigh bin, cylinder speed at 1,100 RPM, slow down fan and concave set on 1.5. Upon harvest, grain samples were analyzed with a Dickey-John Grain Analysis Computer to determine test weight and moisture.

Data were analyzed using JMP Pro 12 (SAS Institute Inc., Cary, NC). Statistical significance is determined at $P \leq 0.05$ level and means separations are reported using Tukey's least significant difference (LSD).

Table 2

Field operations at Kanawha, Nashua and Charles City in 2016.

Location	Previous Crop	Fertilizer	Tillage	Oat planting date	Crown rust assessed	Grain harvest date	Straw harvest date
Kanawha	Soybeans	24-115-156 lb N-P-K/ac in Nov. 2015	Field cultivate on Apr. 6	Apr. 6	July 1	July 26	--
Nashua	Soybeans	11-52-91 lb N-P-K/ac on Mar. 29	Field cultivate on Mar. 29 & Apr. 3	Apr. 4	July 1	July 26	July 27
Charles City	Soybeans	None	Soil finisher on Apr. 4	Apr. 4	--	Aug. 3	--

Results and Discussion

2016 Growing Conditions

Near-normal rainfall and growing degree days were observed at both locations in 2016 (**Table 3**).

Oat variety trial

Entries were analyzed by location and listed in alphabetical order (**Tables 4, 5** and **6**). Reported yields are corrected for 13% moisture. A “percentage of test average” calculation is included to allow for comparison among entries at each location. Yields were greatest at the Nashua site.

Table 3

Rainfall and oat growing degree days (GDD, base 32°F) for 2016 and the long-term normal at Kanawha, Nashua and Charles City.

Month	Kanawha ^a				Nashua ^a				Charles City ^b			
	Rainfall (in.)		GDD		Rainfall (in.)		GDD		Rainfall (in.)		GDD	
	2016	Normal	2016	Normal	2016	Normal	2016	Normal	2016	Normal	2016	Normal
April	1.8	3.2	525	498	2.3	3.7	562	498	1.7	3.6	536	481
May	5.7	3.8	822	823	3.0	4.4	877	823	3.1	4.4	873	861
June	3.3	4.8	1,153	1,098	11.6	5.1	1,169	1,098	8.3	5.1	1,156	1,110
July	5.4	4.0	1,015	1,250	6.1	4.7	1,238	1,250	7.2	4.4	1,224	1,266
TOTAL	16.2	15.8	3,514	3,669	23.0	17.9	3,846	3,669	20.3	17.5	3,789	3,718

^a Data from Kanawha and Nashua were recorded by Schnabel and Pecinovsky.

^b Charles City data were accessed from the Iowa Environmental Mesonet (2016).

Table 4

Results for oat variety trial at Kanawha in 2016.

Variety	Yield (bu/ac)			Yield (% of test avg.)	% Lodging	Test weight (lb/bu)	Plant height at harvest (in.)	Crown rust (1-9)*
	2016	2015	2-yr	2016	2016	2016	2016	2016
Badger	77	141	109	108	15	35	36	3
Betagene	84	170	127	118	85	34	40	2
Deon	74	148	111	104	90	34	42	3
Excel	79	131	105	110	92	36	40	4
Goliath	66	107	87	91	97	35	48	3
Hayden	75	131	103	104	98	37	41	4
Horsepower	66	113	90	92	100	35	36	6
Jerry	64	105	85	89	97	36	44	5
Leggett	52	97	75	72	92	33	39	6
Natty	68	141	105	95	92	37	43	3
Reins	97	--	97	136	83	38	33	4
Rockford	56	89	73	77	98	35	43	6
Saber	99	133	116	137	97	36	37	2
Shelby 427	71	123	97	99	97	38	40	5
Souris	50	103	77	69	100	33	39	8
LSD (0.05)**	30	36			17	2	4	3

*Incidence of crown rust was assessed on a scale from 1 (low) to 9 (high) on July 1.

**The least significant difference (LSD) was calculated at the $P \leq 0.05$ level for each variable.

Test weight and plant height did not tend to differ among the sites. However, much more lodging occurred at Kanawha and Charles City than at Nashua. Lodging at Kanawha also resulted in much lower yields than the previous year.

Saber, Reins, Betagene, Deon, Badger and Excel were among the top performers in terms of yield across locations. These entries also scored low for incidence of crown rust. Hayden, Goliath, Reins and Shelby 427 generally had the greatest test weights across locations. Straw yields were only collected at Nashua with Deon and Natty the top performers in that respect. Reins plants were the shortest at each location, which generally contributed to less lodging than other entries.

Oat millers typically require a test weight of 38 lb/bu before dockage is applied. Reins and Shelby 427 at Kanawha made this requirement while Hayden and Natty were close (**Table 4**). None of the oat varieties at Nashua (**Table 5**) or Charles City (**Table 6**) achieved a test weight greater than 36 lb/bu.



Oat variety trials at Wendy Johnson's farm near Charles City. Photo courtesy of Iowa State University, taken on May 27, 2016.

Table 5

Results for oat variety trial at Nashua in 2016.

Variety	Yield (bu/ac)			Yield (% of test avg.)	% Lodging	Test weight (lb/bu)	Plant height at harvest (in.)	Straw (tons/ac)	Crown rust (1-9)*
	2016	2015	2-yr	2016	2016	2016	2016	2016	2016
Badger	127	137	132	101	53	32	35	1.1	3
Betagene	136	145	141	107	2	33	39	1.4	2
Deon	140	140	140	111	0	35	41	1.8	1
Excel	131	146	139	103	22	32	37	1.3	3
Goliath	132	137	135	105	8	36	47	1.7	2
Hayden	132	152	142	104	3	35	38	1.6	3
Horsepower	116	132	124	92	15	34	33	1.3	4
Jerry	115	129	122	91	5	34	41	1.5	4
Leggett	127	141	134	101	5	33	38	1.5	3
Natty	129	139	134	102	2	35	42	1.7	2
Reins	116	--	116	92	3	35	32	0.9	3
Rockford	131	123	127	104	27	35	44	1.7	4
Saber	136	152	144	108	2	34	36	1.2	4
Shelby 427	115	137	126	91	6	35	41	1.5	3
Souris	121	128	125	96	8	33	36	1.4	4
Tack	116	126	121	92	10	35	35	1.3	3
LSD (0.05)**	26	21			24	1	4	0.4	2

*Incidence of crown rust was assessed on a scale from 1 (low) to 9 (high) on July 1.

**The least significant difference (LSD) was calculated at the $P \leq 0.05$ level for each variable.



Staff of Iowa State University's Northern Iowa Research Farm harvest oats at Wendy Johnson's farm on August 3, 2016. Photo courtesy of Iowa State University.

Conclusions and Next Steps

Selling grain into a specialty market (i.e., for human consumption) takes an increased level of management and care for the final product. Farmers interested in selling oats to food grade milling companies in the northern Cornbelt have some oat varieties to choose from which yield well and can reach close to desired milling specifications.

Of the varieties screened in these trials, Reins was high-yielding at all locations and at one location reached the test weight specification (38 lb/bu) identified by oat millers. Hayden and Natty typically had high test weights and generally produced good yields at all locations. Additionally farmers could use a grain vacuum to further clean oats to increase the test weight of the final product leaving the farm. Grain vacuuming is a common option to further add value to harvested grains behind the farm-gate.

This study is part of an Oat Pilot Project where corn and soybean farmers are working together to provide 500 acres worth of oats to the food and feed markets in north-central Iowa. The results of the 2016 variety trial and the pilot project will further improve our understanding of the barriers and opportunities row crop farmers face when adding oats to their farm business.

Table 6

Results for oat variety trial at Charles City in 2016.

Variety	Yield (bu/ac)	Yield (% of test avg.)	% Lodging	Test weight (lb/bu)	Plant height at harvest (in.)
Badger	74	112	28	33	36
Betagene	70	107	0	32	38
Deon	99	151	0	35	43
Excel	70	108	13	34	38
Goliath	43	66	65	36	51
Hayden	55	84	37	36	42
Horsepower	56	85	63	34	34
Jerry	59	90	57	35	43
Leggett	55	84	70	33	39
Natty	78	119	33	35	42
Reins	90	138	7	35	32
Rockford	49	75	90	36	43
Saber	82	125	37	34	37
Shelby 427	63	96	60	36	39
Souris	41	62	72	34	38
LSD (0.05)*	36		70	1	7

*The least significant difference (LSD) was calculated at the $P \leq 0.05$ level for each variable.

References

Gailans, S., S. Carlson, K. Pecinovsky and B. Lang. 2015. Oat variety and fungicide trials. Practical Farmers of Iowa Cooperators' Program. Ames, IA. <http://practicalfarmers.org/farmer-knowledge/research-reports/2015/oat-variety-and-fungicide-trials/> (accessed Sept. 5, 2016).

Iowa Environmental Mesonet. 2016. Climodat Reports. Iowa State University, Ames, IA. <http://mesonet.agron.iastate.edu/climodat/> (accessed Aug. 23, 2016).

PFI Cooperators' Program

PFI's Cooperators' Program gives farmers practical answers to questions they have about on-farm challenges through research, record-keeping, and demonstration projects. The Cooperators' Program began in 1987 with farmers looking to save money through more judicious use of inputs. If you are interested in conducting an on-farm trial contact Stefan Gailans @ 515-232-5661 or stefan@practicalfarmers.org.