Oat Variety Trial in Northeast Iowa

RFR-A1708

Sarah Carlson, research coordinator
Stefan Gailans, program manager,
Practical Farmers
Ken Pecinovsky, farm superintendent
Brian Lang, extension agronomist

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 the use of a foliar fungicide applied at Feekes 9 growth stage, defined as flag leaf emerged with ligule visible.

Materials and Methods

Fifteen oat varieties were tested in 2017. The soils at the site consist of 83B Kenyon 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 11 lb N/acre, 58 lb P_2O_5/acre, and 135 lb K_2O/acre. On March 22 the site was fertilized with 7 lb N/acre as urea and 73 lb K_2O/acre. The soil test collected in March indicated 33 ppm P Bray1, 248 ppm K, 3.4 percent organic matter, 6.3 pH and 7.0 buffer pH.

On March 23 the site was field cultivated, and then again April 6 in the opposite direction to spread soybean residue. The oats were planted April 7 at four bushels/acre. The planter was a John Deere BD1108 drill with 7.5-in. row spacing, followed by a pass with a cultipacker. Each plot of a variety occupied 731 sq ft and there were four replications. The trial was sufficiently weed-free to not require the use of herbicides or hand weeding.

The trial was harvested July 31 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 2017 season weather had near normal growing degree days and precipitation from April through June, although it was hot and dry from late May through mid-June. July was much wetter than normal (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 9 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 2011-2017.

Acknowledgements

Thanks to Albert Lee Seed House, Grain Millers, Inc., South Dakota State University, Sustainable Food Lab, Practical Farmers of Iowa, Walton Family Foundation, Welter Seed and Honey Company, and Wisconsin Crop Improvement Association.

Table 1. Rainfall and oat growing degree days (GDD) for 2017 and the long-term normal.

	Rainfall, in.		GDD, base 32ºF	
Month	2017	Normal	2017	Normal
April	4.31	3.88	564	498
May	4.79	4.44	790	823
June	5.15	5.40	1,167	1,098
July	8.35	4.75	1,227	1,250
Total	22.60	18.47	3,748	3,669

Table 2. State of origin, PVP[a] and disease ratings[c] for oat varieties included in the 2017 variety trial at the ISU Northeast Research and Demonstration Farm, Nashua.

				Disease name and disease rating[c] on June 30		
Variety	State of origin[a]	PVP[b]	Maturity	Crown rust	BYDV[d]	Septoria
Antigo	WI	PVP	Early	0.75	7.00	2.25
BetaGene™	WI	PVP	Early-mid	0.50	4.25	2.00
Deon	MN	PVP	Late	0.00	3.25	1.25
Goliath	SD	PVP	Mid-late	0.75	2.25	1.50
Hayden	SD	PVP	Early	0.00	2.25	2.75
Horsepower	SD	PVP	Early-mid	0.38	5.50	2.50
Jerry	ND	PVP	Mid-late	0.88	5.88	2.75
Leggett	AAFC	PVP	Mid-late	0.75	4.5	2.25
Natty	SD	PVP	Mid	0.75	3.00	1.75
Reins	IL	PVP	Early	0.50	4.75	2.00
Rockford	ND	PVP	Late	0.25	3.25	2.25
Saber	IL	PVP	Early	0.25	2.75	2.50
Shelby 427	SD	PVP	Mid	0.88	2.00	1.75
Souris	ND	PVP	Mid-Late	2.25	4.63	1.75
Sumo	SD	PVP	Early	0.50	7.75	2.75

[a]Origin: 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.

[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 1-9 scale: 1 = no disease presence; 9 = heavy disease presence.

[d]BYDV = Barley yellow dwarf virus.

Table 3. Performance of 15 oat varieties tested in 2017 at the ISU Northeast Research and Demonstration Farm, Nashua.

Variety	Grain yield[a] July 26 (bu/ac)	Grain moisture (%)	Test weight (lb/bu)	% Heading June 15 (%)	Maturity[b] July 6 (%)	Plant height at harvest (in.)	Lodging at harvest (%)	Straw yield August 1 (DM ton/ac)
Antigo	97.8	13.4	37.7	68	45	28	3	0.94
BetaGene™	115.6	12.5	32.8	30	15	30	0	0.96
Deon	126.8	12.6	34.7	2	3	32	0	1.43
Goliath	118.8	12.8	35.6	0	2	39	28	1.23
Hayden	128.9	12.2	36.3	10	10	32	2	1.30
Horsepower	119.5	12.0	35.3	18	23	26	1	0.90
Jerry	94.0	12.4	35.1	10	25	32	0	0.95
Leggett	117.4	12.2	33.5	5	10	31	0	1.24
Natty	119.6	13.3	35.3	70	30	35	3	1.09
Reins	109.8	13.0	36.3	65	48	25	0	0.85
Rockford	100.8	13.0	34.8	2	6	35	0	1.26
Saber	121.8	12.3	34.3	40	38	27	0	1.05
Shelby 427	102.2	12.8	36.3	55	25	32	0	1.13
Souris	116.0	12.1	33.4	10	20	30	2	0.99
Sumo	104.0	12.9	36.1	80	43	29	3	1.16
Average	112.9	12.6	35.2	31	23	31	3	1.10
LSD[c] 0.05	15.0	0.8	0.6	- -	- -	2	3	0.16

[a]Grain yields are based on 32 lb/bushel test weight.
[b]Maturity rating on July 6 as percent yellow.
[c]LSD = 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, 2014-2017[a]

	2014		2015		2016		2014-2016 avg.		2015-2017 avg.	
Variety	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	127.1	32.0	119.1	30.5	- -	- -
BetaGene™	- -	- -	145.1	33.0	135.6	33.0	- -	- -	132.2	32.9
Deon	104.5	30.7	139.6	35.2	140.5	35.0	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	122.8	34.6	129.5	36.1
Hayden	92.2	30.7	151.6	36.3	132.1	35.4	125.3	34.1	137.6	36.0
Horsepower	78.3	27.8	131.6	35.0	116.0	34.0	108.6	32.3	122.4	34.8
Jerry	79.7	29.3	129.1	35.7	114.8	33.8	107.9	32.9	112.7	34.9
Leggett	- -	- -	141.4	33.8	127.1	33.5	- -	- -	128.7	33.6
Natty	97.2	29.8	138.6	36.5	129.3	35.1	121.7	33.8	129.2	35.6
Rockford	- -	- -	123.3	36.2	131.4	35.2	- -	- -	118.5	35.4
Saber	102.2	30.2	151.7	33.6	135.7	33.6	129.9	32.5	136.4	33.8
Shelby 427	82.7	30.3	137.5	35.5	114.5	34.7	111.6	33.5	118.1	35.5
Souris	- -	- -	127.8	33.3	121.0	33.0	- -	- -	121.6	33.3
Tack	- -	- -	125.6	36.2	116.5	35.2	- -	- -	- -	- -
Average	81.5	29.5	137.4	34.6	137.4	34.6	119.5	32.9	126.9	34.7
LSD 0.05	7.0	1.1	8.6	0.9	15.1	1.1	- -	- -	- -	- -

[a]Complete reports for the 2011-2016 Oat Variety Trials are available at: http://farms.ag.iastate.edu/content/northeast-research-and-demonstration-farm.
[b]LSD = least significant difference. Entries that differ by one LSD or more are considered to be in different classes with 95 percent certainty.