

Oat Variety Trial in Northeast Iowa

RFR-A1947

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 pasture, or for early-season forage. Because oats mature in late July to early August, these allow cropping options for the rest of the season including establishment of perennial forage or cover crops, and a timely window for manure application.

Careful management and proper choice of variety can make oats a profitable crop due to the 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.

Oat growth in Iowa is regularly affected by crown rust, stem rust, and barley yellow dwarf virus (BYDV). 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 2019. The soils at the site consist of 83B Kenyon loam and 198B Floyd loam. The site had been soybean the previous year and has been in a soybean-oat crop rotation for over 10 years.

The site was soil tested in fall and then fertilized with 60 lb P₂O₅/acre as triple super phosphate and 267 lb K₂O/acre as 0-0-60. On April 8, the site was fertilized with 30 lb N/acre as urea.

On April 8, the site was field cultivated, and cultivated again April 9 in the opposite direction to spread soybean residue. The oats were planted April 9 with a John Deere 1108BD seeder to drill four bushels/acre at 7.5-in. row spacing and followed with a cultipacker pass.

Each plot of a variety occupied 731 sq ft and there were four replications. The trial was sufficiently weed-free and did not require herbicides or hand weeding. Disease evaluations were conducted June 24 for crown rust, stem rust, BYDV, septoria, and lodging. Final evaluations on lodging and plant heights were taken July 16.

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 2019 rainfall from April through July was 3 in. below normal with a wet May and dry June. Total growing degree days (GDD) for each month, April through July, were similar to the historic averages (Table 1).

Results and Discussion

Diseases were evaluated June 24 and rated on a zero to nine scale (Table 2). Yields are provided in Table 3 and 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.

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

weights from trials for the last four years. Individual reports for oat variety trials from 2011-2018 are available at: <http://farms.ag.iastate.edu/content/northeast-research-and-demonstration-farm>

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 2019 and historical average (1989-2018).

Month	Rainfall, in.		GDD, base 32°F	
	2019	Normal	2019	Normal
April	3.77	3.90	482	498
May	6.32	4.64	741	823
June	2.89	5.99	1,098	1,098
July	3.46	4.91	1,290	1,250
Total	16.44	19.44	3,611	3,669

Table 2. State of origin, PVP, and disease ratings for oat varieties included in the 2019 variety trial.

Variety	State of origin ^a	PVP ^b	Maturity	Disease, variety rating ^c , and disease rating ^d June 24							
				Crown rust		Stem rust		BYDV ^e		Septoria	
Antigo	WI	PVP	Early	MR	0.5	S	0	MR	1.75	MR	3.25
Deon	MN	PVP	Late	MR	0.5	MS	0	MR	4	R	0.5
Esker 2020	SD	PVP	Early-mid	MS	0.25	MS	0	--	3.5	--	3
Excel	IN	PVP	Early-mid	MS	1.75	S	0	R	1	MR	0.5
Goliath	SD	PVP	Late	MS	1.75	R	0	MR	1.25	MR	0.75
Hayden	SD	PVP	Mid-late	MS	1	MS	0	MR	1	R	2.5
Horsepower	SD	PVP	Early-mid	MS	2.25	MS	0	MS	1.5	MR	0.75
Jerry	ND	PVP	Mid-late	MS	2	MS	0	MS	3.25	MS	0.5
MN11211Pearl	MN	PVP	Late	MR	0	MS	0	MR	1.25	R	1
Natty	SD	PVP	Early	MS	1.25	MR	0	--	1.5	--	0.75
Reins	IL	PVP	Early	MR	1.5	MR	0	R	1.25	R	0
Ron	WI	PVP	Mid-late	MR	0	--	0	--	2	--	0.25
Saddle	SD	PVP	Early	MR	0.25	S	0	--	1	--	1
Shelby 427	SD	PVP	Early-mid	MS	0.75	MS	0	MR	1	MR	1
Sumo	SD	PVP	Early	MR	0	R	0	MS	1.25	R	0.75
Warrior	SD	PVP	Mid-late	R	0.25	--	0	MS	3	--	0.75

^aIL = University of Illinois, IN = Indiana State 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, variety rating from developer: S = susceptible, MS = moderately susceptible, MR = moderately resistant, R = -resistant.

^dDisease rating evaluated June 24, 2019 on a 0-9 scale: 0 = no disease presence; 9 = dead.

^eBYDV = Barley yellow dwarf virus.

Table 3. Performance of 16 oat varieties tested in 2019 at the ISU Northeast Research and Demonstration Farm, Nashua.

Variety	Grain yield ^a	Grain moisture (%)	Test weight (lb/bu)	Heading June 15 (%)	Plant height at harvest (in.)	Lodging at harvest (%)	Straw yield
	July 24 (bu/ac)						July 25 (DM ton/ac)
Antigo	120.9	12.8	39.0	86	38	28	1.4
Deon	117.2	12.5	35.5	2	41	3	2.0
Esker 2020	131.7	12.1	33.7	68	40	28	1.6
Excel	130.8	12.0	34.6	55	38	28	1.4
Goliath	123.7	12.6	36.6	2	44	31	1.9
Hayden	131.1	12.9	36.3	7	40	14	1.7
Horsepower	120.9	12.2	36.1	60	36	80	1.2
Jerry	120.8	12.9	36.6	16	42	73	1.7
MN11211-Pearl	140.6	13.5	34.9	2	38	4	1.6
Natty	135.2	12.6	37.3	90	44	29	1.6
Reins	131.1	13.3	37.2	94	35	31	1.3
Ron	127.6	12.9	34.2	6	39	4	1.7
Saddle	142.1	13.2	36.0	88	39	2	2.0
Shelby 427	123.7	12.5	37.3	78	40	33	1.5
Sumo	127.0	12.8	37.9	94	40	14	1.5
Warrior	114.8	13.1	33.4	9	37	2	1.8
Average	127.5	12.7	36.0	47	39	25	1.6
LSD ^b 0.05	16.1	1.0	0.9	--	3	17	0.4

^aGrain yield 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 percent certainty.

Table 4. Individual and 4-yr average of oat variety trial results at the ISU Northeast Research and Demonstration Farm, Nashua, 2016-2019.^a

Variety	2016		2017		2018		2019		4-yr average	
	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/ac	yield bu/ac	test wt lb/ac
Antigo	--	--	98	37.7	79	34.5	121	39.0	99	37.1
Deon	140	35.0	127	34.7	109	33.1	117	35.5	123	34.6
Esker 2020	--	--	--	--	--	--	132	33.7	132	33.7
Excel	131	32.5	--	--	--	--	131	34.6	131	33.6
Goliath	132	36.2	119	35.6	--	--	124	36.6	125	36.1
Hayden	132	35.4	129	36.3	101	34.5	131	36.3	123	35.6
Horsepower	116	34.0	120	35.3	70	32.8	121	36.1	107	34.6
Jerry	115	33.8	94	35.1	80	32.0	121	36.6	102	34.4
MN11211-Pearl	--	--	--	--	--	--	141	34.9	141	34.9
Natty	129	35.1	120	35.3	98	34.0	135	37.3	121	35.4
Reins	116	35.0	110	36.3	90	34.1	131	37.2	112	35.6
Ron	--	--	--	--	101	31.9	128	34.2	114	33.1
Saddle	--	--	--	--	86	32.8	142	36.0	114	34.4
Shelby 427	115	34.7	102	36.3	81	34.1	124	37.3	105	35.6
Sumo	--	--	104	36.1	86	34.0	127	37.9	106	36.0
Warrior	--	--	--	--	--	--	115	33.4	115	33.4
Average	125	34.6	112	35.2	90	34.7	127	36.0	116	34.9
LSD ^b 0.05	26	1.1	15	0.6	17	1.6	16	0.9	--	--

^aGrain yield 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 percent certainty.