

2018 Oat Field Crop Trials Results



Minnesota Agricultural Experiment Station and the College of Food, Agricultural and Natural Resource Sciences

This past growing season was harsh for both oat production and oat variety evaluations. Uniform replicated trials tested across Minnesota included Waseca, Le Center, Lamberton, Kimball and Morris in Southern Minnesota (south of I-94). In Northern Minnesota (north of I-94) trials were conducted in Fergus Falls, Crookston, Stephen and Roseau. In addition, entries were evaluated for disease resistance to crown rust, barley yellow dwarf virus (BYDV), and smut in specific inocu-

lated nurseries. High winds, flooding, and/or hail caused yield trials near Morris, Kimball, Waseca and Crookston to be abandoned.

The results of the variety evaluations are summarized in Tables 1 to 3. The greatest challenges in oat production and performance evaluation continues to be lodging and crown rust. All yield performance trials were treated with a propiconazole based fungicide when the flag leaf was fully extended

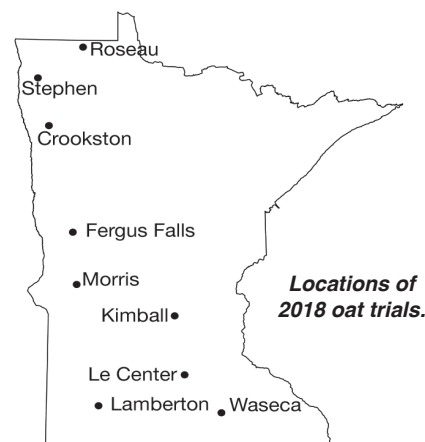


Table 1. Origin and agronomic characteristics of oat varieties in Minnesota in multiple-year comparisons (2016-2018).

Entry	Origin	Year of Release	Legal Status	Seed Color	Days to Heading (Days)	Plant Height (Inches)	Straw Strength ⁴ (1-9)	Test Weight (lbs/Bu)	Groat ⁵ (%)	Grain Protein ⁶ (%)	Oil (%)
Antigo ¹	WI	2017	Pending	Yellow	58	36	3	38	68	13.8	5.3
Badger	WI	2010	PVP(94)	Yellow	57	35	5	36	69	13.4	4
Betagene	WI	2015	PVP(94)	Yellow	62	38	5	35	72	13.3	4.3
CS Camden	Meridian Seeds	2013	Pending	White	65	39	3	35	67	13.3	4.7
Deon	MN	2014	PVP(94)	Yellow	65	41	4	37	69	12.8	4.7
Goliath	SD	2013	PVP(94)	White	65	48	6	37	70	13.2	4.5
Hayden	SD	2015	PVP(94)	White	63	42	5	38	69	12.7	5.3
Horsepower	SD	2012	PVP(94)	White	61	36	4	36	69	12.8	4.6
MN Pearl	MN	2018	Pending	White	63	41	3	36	71	12.9	6.3
Jury	ND	2012	PVP(94)	White	63	44	6	37	69	12.6	5.1
Natty	SD	2015	PVP(94)	White	59	42	5	38	72	13.8	3.5
Newburg	ND	2011	PVP(94)	White	64	44	7	35	68	12.4	4.9
Paul ^{2,3}	ND	1996	PVP(94)	Hulless	—	42	9	—	—	17	7.5
Reins	IL	2016	PVP(94)	White	59	33	3	38	70	14.2	4.1
Ron	WI	2014	PVP(94)	Yellow	63	40	5	36	69	14.3	4.8
Saber	IL	2010	PVP(94)	Yellow	58	36	4	37	72	14.2	4.2
Saddle ²	SD	2018	Pending	White	57	36	1	—	72	14.3	4.2
Shelby 427	SD	2011	PVP(94)	White	59	40	5	38	70	13.3	5.1
Streaker ³	SD	2016	PVP(94)	Hulless	60	41	6	—	—	17.5	6.6
Sumo ¹	SD	2017	Pending	White	57	37	3	37	70	14.9	3.8

¹Line tested in 2017 and 2018.

²Line tested in 2018 only.

³Hulless oat.

⁴1 = resistant, 9 = susceptible.

⁵Trait measured in 2016 and 2017 only.

⁶Whole grain NIRS, trait measured in 2017 and 2018.

(Feekes 9) to evaluate the yield potential. However, in some locations in Southern Minnesota crown rust infection was still present later in the season.

The origin and agronomic characteristics of oat varieties tested are listed in Table 1. The U.S. Plant Variety Protection Act (PVP) status is also listed. PVP(94) notation indicates that seed of that variety may not be sold by a grower without the permission of the variety's owner. If the PVP is pending consider the variety as having PVP(94) protection. Maturity, height and test weight data are presented here as state wide averages from 2016-2018 except where noted. Lodging data is also a state-wide average from the same time period, but only from locations where lodging was present. Maturity, height and lodging are an important consideration for variety selection based on the intended location and expected end use of the crop. In general earlier maturing varieties

perform better in Southern Minnesota so flowering can occur during cooler periods. In these locations, a variety maturing similar to Saber or Reins may be a good choice. In Northern locations varieties that mature later such as Hayden or Deon may be prudent.

If the intended end use of the variety is forage or alfalfa nurse crop a taller variety with lodging resistance such as Goliath may be a good choice. For grain production, lodging is still an important consideration as well as grain quality traits such as groat percent, protein percent and oil percent (Table 1). Groat percent is an average of the 2016 and 2017 crop years, whereas the others are averages of 2017 and 2018 crop years. Test weight and groat percentage are important considerations for grain production. Perhaps carrying equal consideration to yield if the crop is intended for food or feed. Hull color may also be a consideration for different end uses. Percent protein and oil are important considerations for hu-

man food oat production, where high protein and low oil may be desirable. Contact your local elevator or buyer whether processors have a preferred or recommended varieties for milling. Two hullless lines were evaluated for possible use as a feed crop.

Crown rust and other disease resistance ratings are listed in Table 2. All disease scores were converted to a "1-9" scale. Where "1" is very resistant and "9" is very susceptible. Crown rust continues to be a major limiting factor to oat production in Minnesota that must be managed to achieve optimal yield. Buckthorn, the alternate host of crown rust is widespread in Minnesota, allowing the pathogen population to be present annually and particularly aggressive. Crown rust resistance was evaluated in the Buckthorn Nursery in St. Paul by the USDA-ARS, and represents an exceptionally aggressive crown rust population. The most economical way of controlling crown rust is the use of a resistant variety. However, application of fungicide to a variety with rating of "4" or greater is prudent if crown rust is present in the lower canopy at Feekes 9.

Deon continues to be one of the best varieties for crown rust resistance. In addition, the new variety Antigo also show good resistance. Crown rust is a rapidly evolving disease; the rust ratings taken this year compared to last year's numbers are the same indicating that the pathogen has not overcome current genetics. Other important diseases include BYDV and smut which were evaluated in inoculated nurseries at the University of Illinois and the University of Minnesota, respectively. Varieties susceptible to BYDV (>3) should be selected with caution particularly in the Southern Minnesota, where infected aphids are more common early in the season. A seed treatment and certified seed should be utilized to manage smut. Disease resistance may be a driving factor if pesti-

Table 2. Disease characteristics of oat varieties.

Entry	Crown Rust (1-9) ³	BYDV (1-9) ⁴	Loose Smut (1-9) ⁵
----- (1-9) -----			
Antigo ¹	2	7	2
Badger	6	5	1
Betagene	4	6	1
CS Camden	4	-	2
Deon	3	4	1
Goliath	6	2	3
Hayden	6	3	1
Horsepower	6	7	2
MN Pearl	5	6	1
Jury	5	5	2
Natty	5	4	2
Newburg	5	4	4
Paul ²	6	—	1
Reins	6	—	1
Ron	3	6	1
Saber	6	6	5
Saddle ²	4	—	2
Shelby 427	6	6	1
Streaker	5	—	1
Sumo ¹	5	—	1

¹Line tested in 2017 and 2018.

²Line tested in 2018 only.

³2017 and 2018, 1 = most resistant, 9 = most susceptible.

⁴2016 and 2017, 1 = most resistant, 9 = most susceptible.

⁵2016 thru 2018, 1 = most resistant, 9 = most susceptible.

cides are not economical or intended production is an organic system.

Yield performance evaluation from locations in 2018 and the associated 2-year and 3-year averages are listed in Table 3. In addition, the state wide averages are also listed. To standardize the data across locations the yield is expressed as percent of the trial mean. MN Pearl has replaced Deon as UMN top yielding line in state wide averages for 2018 and in multi-year comparisons.

Among the newer varieties in evaluation are Saddle and MN Pearl. Saddle has moderate crown rust resistance, early maturity and high lodging resistance. MN Pearl has moderate crown rust resistance and good yield potential in northern Minnesota with moderate lodging resistance. In general yield performance from single years should be viewed cautiously as environmental

variability may significantly affect the yields in single locations or years. For example, lodging in Le Center and crown rust in Waseca in past years may have skewed yield results to favor varieties with resistance to these production issues. From this year's trials MN Pearl, Natty, CS Camden, Goliath and Deon are recommend in northern Minnesota and MN Pearl, CS Camden, Hayden, Ron and Goliath in southern Minnesota.

Project Leaders

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Oat

Planting Rate and Date

Bushel Weight, Pounds.....	32
Seeds/Pound.....	16,200
Planting Rate, Pounds/Acre.....	80
Planting Rate, Seeds/Sq. Ft.....	28
Planting Date.....	Early Spring

Table 3. Relative grain yield of oat varieties in Minnesota in single-year (2018) and multiple-year comparisons (2016-2018).

Entry	Waseca ³		Le Center		Lamberton		Fergus Falls		Crookston ³		Stephen		Roseau		State	
	2 Yr	2018	3 Yr	2018	3 Yr	2018	2 Yr	2 Yr	2018	3 Yr	2018	3 Yr	2018	3 Yr	2018	3 Yr
Antigo	101	90	94	99	97	96	90	68	88	101	94	94	97	98	97	98
Badger	113	92	111	84	90	77	84	99	93	98	97	96	98	106	98	106
Betogene	114	94	115	112	109	100	94	108	108	105	109	102	109	114	109	114
CS Camden	108	101	115	127	119	120	119	100	106	99	103	112	109	116	109	116
Deon	109	104	111	120	123	106	103	105	108	114	111	114	102	116	102	116
Goliath	113	102	104	125	110	104	110	103	114	112	109	92	107	109	107	109
Hayden	108	101	108	106	108	116	117	117	97	105	108	117	104	118	104	118
Horsepower	84	110	102	88	89	105	111	103	94	98	116	110	101	103	101	103
Jury	96	108	109	107	105	109	110	107	108	107	91	101	100	107	100	107
MN Pearl	99	123	126	132	121	125	118	100	108	111	125	123	116	121	116	121
Natty	122	116	113	108	107	113	108	109	110	104	111	108	110	113	110	113
Newburg	90	100	108	104	104	115	117	105	106	107	85	88	98	106	98	106
Paul ^{1,2}	—	67	75	63	60	71	75	—	76	81	69	69	71	71	71	71
Reins	119	92	113	71	88	75	75	106	113	95	104	103	101	108	101	108
Ron	121	110	114	119	114	110	113	105	99	105	106	100	111	118	111	118
Saber	125	107	107	94	109	107	95	111	94	97	106	101	103	114	103	114
Saddle	81	104	107	95	103	85	97	0	114	121	108	113	104	109	104	109
Shelby 427	63	92	102	90	90	83	92	0	106	100	100	98	104	104	104	104
Streaker ²	73	60	56	70	79	96	65	87	68	73	61	72	75	76	75	76
Sumo	91	87	69	87	87	84	83	68	90	90	88	87	90	88	90	88
Mean (Bu/Acre)*	103	153	136	126	132	148	140	141	162	152	172	172	149	120	149	120
LSD (0.10)	16	22	24	14	11	23	15	21	40	25	18	17	49	31	49	31

¹Line tested in 2018 only.

²Hulless oat.

³Trial not reported in 2018 due to weather.

*Line values are expressed as percent of the trial mean for line by location comparison.