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2017-2018 Multi-State Organic Oat Variety Trial Results

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The tight production margins currently present in agriculture have increased interest in growing organic oats. Oats can be a good crop for a beginning organic producer because the crop provides good early season growth to compete with weeds. In order to provide producers with oat performance data, twenty oat varieties were tested in three locations across Minnesota, South Dakota, and Wisconsin in 2017-2018. Results are summarized in this publication. Important management considerations for organic oat production, other than variety selection, have been summarized in an online extension article from University of Minnesota Extension which can be found at: <https://extension.umn.edu/small-grains-crop-and-variety-selection/organic-oat-production>.

Agronomic characteristics such as maturity ratings, lodging scores and crown rust resistance for the varieties used in this trial are summarized in Table 1. Several grain quality and milling characteristics are summarized in Table 2. Average test weights for the trials are summarized in Table 3.

Oat yields in the multi-state organic oat trials averaged 71 bu/acre in 2017-2018, ranging from 60 bu/acre at Lamberton, MN (2018) to 102 bu/acre at Evansville, WI (2017) (Table 4). Varieties that were statistically in the top yield group include **Betagne**, **Deon**, **Saddle**, and **Goliath**. There was a 37 bu/acre difference between the best and worst performing variety in the trial. If one assumes a price of \$5.25/bu, that equates to a revenue difference of \$194.25 per acre.

Producers need to consider several factors other than yield performance when selecting suitable oat varieties for organic production. Because conventional fungicides can't be applied in organic production, it is recommended to choose a cultivar resistant to crown rust. In susceptible cultivars, infection with crown rust can cause severe yield loss and significantly reduce test weight and grain quality. Antigo, Deon, Leggett, Saddle and Sumo are cultivars with good levels of resistance to crown rust (Table 1). Test weight is also a very important consideration and highly variety-dependent. Grain specifications for organic food grade oats include a minimum test weight and a maximum proportion of thin kernels. Varieties which exhibited excellent test weight included Antigo and Sumo. Fan speed can be increased on the combine to increase test weight.

It is usually recommended to consider as much performance information as possible when selecting a variety and to give more weight to information from trials close to home, as some varieties may be better suited to certain geographic areas. Also pay close attention to relative performance over many locations. This type of performance is an indication of yield stability. Performance over multiple years is also very important. Growing conditions in a single season may favor certain varieties and provide a poor representation of yield potential over time.

It is important to remember that varieties may differ by 5 bu/acre or even more and still be statistically similar. This is due to inherent variability in the environment and the yield testing process. Varieties that are statistically similar to the top performing variety at each location can be calculated by subtracting the least significant difference (LSD) value from the top performing variety. The LSD is a statistic used to determine if varieties are truly different from one another.

The coefficient of variation (CV) listed at the bottom of each data column, which is often expressed as a percentage of a given trait mean, is a relative measure of the amount of test variation for that trait. Generally, in yield trials, a CV of 15% is considered acceptable and a CV of 10% or less indicates good quality data. Higher variability (and thus higher CVs) can be caused by several environmental factors, such as stand loss due to residue cover, heavy precipitation, or weed pressure and reduces the ability to detect true varietal differences.

The field evaluations summarized in this publication were supported by the SARE Partnership Grant Program. This project involved the input and participation of Mark Doudlah, organic farmer in Evansville, WI, Carmen Fernholz, organic farmer in Madison, MN, and Jesse Hall, farmer in Arlington, SD.

Table 1. List of organic oat varieties tested along with origin, agronomic characteristics, and crown rust ratings.

Variety	Origin and Year		Agronomic Characteristics			Disease Ratings
	Origin†	Year of Release	Relative Heading‡ (days)	Relative Height‡ (inches)	Lodging Score (1-9)§	Crown Rust (1-9)¶
Antigo	WI	2017	2	4	6	1
Badger	WI	2010	1	1	6	6
Betagene	WI	2014	6	5	3	3
Deon	MN	2013	9	8	4	2
Excel	IN	2006	4	4	4	6
Goliath	SD	2012	10	11	6	3
Hayden	SD	2014	7	5	4	4
Jerry	ND	1994	6	6	5	7
Leggett	CAN	2005	11	4	3	1
Natty	SD	2014	3	7	5	5
Newburg	ND	2011	9	8	7	5
Oravena	CAN	2014	8	8	4	3
OT8006	CAN	2017	Very late	8	4	3
Reins	IL	2015	2	0	4	6
Rockford	ND	2009	9	8	7	5
Saber	IL	2010	2	4	6	7
Saddle	SD	2017	1	3	2	1
Shelby 427	SD	2009	4	7	5	6
Souris	ND	2006	8	4	5	6
Sumo	SD	2016	0	5	4	1

† CAN - Canada, IL - Illinois; IN - Indiana; MN - Minnesota, ND - North Dakota, SD - South Dakota, WI - Wisconsin

‡ Days to heading compared to Sumo (170 days Julian) and height in inches compared to Reins (30 inches).

§ Lodging score: Rating scale 1-9 (1=Good to 9=Poor)

¶ Crown rust rating: Rating scale 1-10 (1=most resistant to 9=most susceptible) - field ratings from Madison, WI in 2018.

Table 2. Grain quality and milling characteristics.

Variety	% Plump	% Mid	% Thin	1000 Kernel Weight (g)	Groat %	NIR groat protein (%)	NIR groat beta-glucan (%)	NIR Oil (%)
Antigo	8.0	71.9	20.0	25.6	63.0	17.2	4.6	5.9
Badger	42.8	51.3	5.9	36.3	61.7	14.2	4.3	4.9
Betagene	60.8	35.3	3.8	36.5	66.2	14.4	5.5	4.6
Deon	26.3	63.7	10.0	34.0	64.9	13.8	4.4	5.4
Excel	49.3	43.2	7.6	32.2	60.2	14.0	4.1	4.4
Goliath	24.0	64.0	12.0	30.8	63.0	13.4	4.6	5.0
Hayden	18.9	69.0	12.1	32.7	63.6	13.3	4.7	6.0
Jerry	25.2	62.7	12.1	31.8	62.4	14.7	4.5	4.7
Leggett	47.1	48.5	4.3	35.1	63.2	15.9	4.5	4.5
Natty	30.3	61.1	8.5	31.7	64.7	13.5	3.8	3.8
Newburg	28.1	56.5	15.4	31.1	62.5	13.4	5.1	5.6
OT8006	56.7	37.2	6.0	34.4	55.1	14.4	4.7	5.7
Oravena	62.1	33.6	4.3	40.1	62.6	15.3	4.9	4.4
Reins	26.7	63.7	9.5	31.5	65.8	14.2	4.7	4.9
Rockford	16.0	64.6	19.4	27.4	60.8	13.4	4.8	6.5
Saber	17.5	66.9	15.8	29.8	64.8	13.9	4.4	4.5
Saddle	21.6	71.9	6.4	30.2	67.2	15.0	4.1	4.1
Shelby 427	21.0	65.7	13.3	28.8	65.2	13.6	4.3	5.6
Souris	18.4	63.7	17.8	30.0	63.4	13.5	4.5	4.6
Sumo	54.9	41.8	3.3	34.1	65.3	16.5	4.0	4.1
Trial Average	33.4	56.6	10.0	31.9	63.7	14.2	4.5	5.0
LSD(0.05)†	3.7	3.0	1.8	1.3	2.1	0.6	0.1	0.2
C.V.%‡	15.8	7.6	26.3	5.7	4.2	5.8	4.2	5.2

† Value required (\geq LSD) to determine if varieties are significantly different from one another.

‡ C.V. is a measure of variability or experimental error

Table 3. Test weights (lbs/bu) for organic oat varieties at each trial location, sorted by overall 2-year average.

Variety	2017 Arlington, SD	2017 Evansville, WI	2018 Evansville, WI	2018 Lamberton, MN	2018 Madison, WI	2-year average
	-----Test Wt (lbs/bu)-----					
Antigo	37.2	40.5	36.6	35.7	33.0	36.6
Sumo	36.8	38.8	35.7	37.7	33.3	36.5
Saddle	35.2	37.1	33.8	34.9	32.5	34.7
Leggett	36.9	35.0	35.2	35.1	30.1	34.5
Hayden	37.2	34.5	34.6	35.1	31.0	34.5
Natty	36.3	36.8	33.0	35.6	29.4	34.2
Shelby 427	36.0	35.8	33.9	34.5	30.0	34.0
Deon	35.2	37.2	33.6	35.0	28.0	33.8
Reins	32.2	38.3	33.9	34.3	30.3	33.7
Goliath	37.0	36.6	32.9	35.0	25.8	33.4
Jerry	35.6	33.7	30.4	33.3	27.9	32.2
Souris	34.9	32.8	32.2	33.2	27.6	32.1
Betagene	34.9	33.8	32.3	32.3	27.2	32.1
Saber	34.9	34.7	30.5	33.1	27.0	32.0
Rockford	37.4	32.2	28.5	30.4	29.1	31.5
Excel	33.9	32.7	31.7	32.9	24.9	31.2
Badger	34.8	34.6	29.5	31.8	25.3	31.2
Oravena	33.5	31.2	30.0	34.6	25.6	31.0
Newburg	33.9	32.1	29.0	32.7	26.9	30.9
OT8006	36.1	30.8	26.5	32.4	23.5	29.8
Trial Average	35.5	35.0	32.2	33.9	28.3	33.1
LSD(0.05)†	1.2	1.5	2.5	1.6	2.9	0.9
C.V.%‡	2.5	3.4	5.6	3.2	6.5	4.6

† Value required (\geq LSD) to determine if varieties are significantly different from one another.

‡ C.V. is a measure of variability or experimental error, 15% or less is considered acceptable.

Table 4. Grain yield (bu/acre) for organic oat varieties at each trial location, sorted by overall 2-year average.

Variety	2017 Arlington, SD	2017 Evansville, WI	2018 Evansville, WI	2018 Lamberton, MN	2-year average
	-----Yield (bu/acre)-----				
Betagene	63.6	128.6	77.7	90.4	90.1
Deon	61.6	129.5	75.7	76.3	85.8
Saddle	62.2	125.6	59.1	70.8	79.4
Goliath	64.7	117.5	52.4	66.7	75.3
Antigo	48.4	116.9	55.1	67.4	71.9
Natty	64.9	101.0	57.1	63.7	71.7
Excel	61.7	108.7	55.8	59.9	71.5
Sumo	49.8	100.4	70.5	59.3	70.0
Saber	66.8	109.6	40.5	61.3	69.6
Hayden	74.8	101.8	39.6	59.1	68.8
Newburg	72.2	99.9	30.1	66.6	67.2
Badger	47.3	95.9	57.5	65.9	66.6
OT8006	71.2	104.4	41.3	45.7	65.6
Leggett	72.7	98.3	51.5	35.5	65.3
Shelby 427	58.5	93.0	49.2	47.3	62.0
Reins	26.0§	103.0	66.5	46.0	60.4
Oravena	65.7	72.3	35.9	59.7	58.4
Rockford	67.7	83.1	22.8	53.5	56.8
Souris	60.3	75.6	28.2	53.6	54.4
Jerry	58.5	77.9	27.8	47.7	53.0
Trial Average	60.9	102.2	49.7	60.3	70.9
LSD(0.05)†	12.7	16.3	11.6	15	8.03
C.V.%‡	14.7	12.7	16.5	14.8	16.2

† Value required (\geq LSD) to determine if varieties are significantly different from one another.

‡ C.V. is a measure of variability or experimental error, 15% or less is considered acceptable.

§ Reins was affected by Rodent damage at Arlington, SD in 2017.