

Iowa Crop Performance Tests - Oat and Barley, 1997-2000

Oats and Barley for Iowa

Oats and barley are the major spring-sown small grain crops in Iowa. Spring-sown small grains can be used for grain and straw production, as companion crops to establish pastures, or as a source of early-season forage or hay. Because these small grains generally mature before the end of July in Iowa, a forage legume, cover crop, or green manure crop can follow them, or animal manure can be spread on the field in which they were grown. Oat grain production is best under cool conditions, which rarely occur during Iowa summers, but 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. Test weight is the most commonly used indicator of grain quality, and high test-weight varieties should be chosen by growers who intend to market oat grain. Oats are regularly affected by crown rust and barley yellow dwarf virus diseases in Iowa. Some varieties have adequate resistance or tolerance to these diseases, and disease resistance should be considered when choosing an oat variety. Because the pathogen populations can change from year-to-year, varietal resistance often breaks down within a few years, and growers should consider switching to a newer variety when this occurs. Barley performs best where high temperatures and high humidity do not occur simultaneously. Well-drained, fertile soils are essential for producing good quality barley. Barley grows best in the northwestern and north central regions of Iowa. Barley grain can be infected with the scab fungus, which is prevalent in the state. Scab-infected grain may have mycotoxins that are detrimental to animals. Oats do not get the scab disease.

The 2000 Growing Season

According to Iowa Agricultural Statistics, 170,000 acres of oats were harvested for grain in Iowa in 2000. This is a decrease from 175,000 acres harvested for grain in 1999. The 2000 state average grain yield was 66 bu./A, and 11.2 million bu. of oat grain were produced in the state, compared to 11.4 million bushels in 1999. Nationwide, 153 million bu. of oat grain were produced on 2.4 million acres in 2000 compared to 146 million bu. produced on nearly the same acreage in 1999. The Iowa average oat grain yield this year was more than the national average of 62.3 bu./A, and more than the 1999 Iowa average oat yield of 65 bu./A. Records are not maintained of barley acreage or production in Iowa. Nationally, barley acreage increased in 2000 compared to the previous year, with 5.2 million acres harvested for grain. The 1999 total barley acreage in the U.S. was the lowest since national records have been maintained.

A mild and dry winter allowed early planting oats in most of Iowa in 2000. Planting of oats before April 15 is recommended for optimal yields in Iowa. This year most of the oat acreage was planted in March and early April, which was about two weeks earlier than in 1999. Mild weather during April and May caused early heading and maturity. Yields and test weight varied across the state because of moisture stress in some locations.

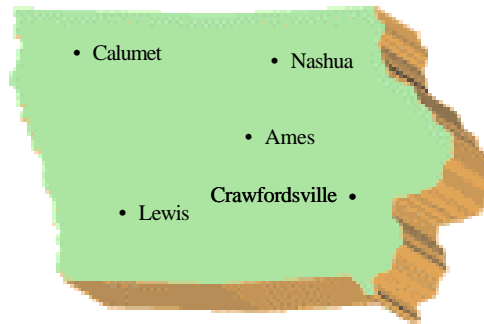


Figure 1. Location of oat and barley performance trials.

How Oat Tests Are Conducted

Yield trials of oats and barley are conducted annually by Iowa State University and the Iowa Crop Improvement Association. Twenty-eight spring oat varieties were tested at five locations in Iowa (Figure 1). Testing locations in 2000 were near Ames in central Iowa (planted March 14, harvested July 12), near Lewis in southwestern Iowa (planted March 20, harvested July 13), near Crawfordsville in southeastern Iowa (planted March 15, harvested July 20), near Calumet in northwestern Iowa (planted March 28, harvested July 21), and near Nashua in northeastern Iowa (planted March 30, harvested July 18). Each plot of a variety occupied 32 square feet of land and consisted of four rows spaced one foot apart. Narrower row spacing can be used to allow denser plantings, higher yields and better competition against weeds. All plots were maintained weed-free by hand without use of herbicides. All tests were grown on land that had been in soybeans in the previous year. Fertilizer was broadcast before spring land preparation. Seeding rate was based on equal numbers of seeds per plot, at rates that approximated three bu./A. Cultural practices varied, but in general, all tests were conducted under conditions of high fertility, as recommended to farmers in Iowa Extension pamphlet P-1048, Production of Small Grains in Iowa. Plots were replicated three times at each location to average out the effects of soil variability. All plots were drilled and harvested with small plot equipment.

Yields, test weights, straw yields, and groat percents (the weight of grain that is due to groats rather than hulls) were recorded from seed grown at all five locations (Ames, Crawfordsville, Calumet, Lewis, and Nashua). Heading dates and plant heights were recorded at Ames only.

All disease ratings were recorded in 1999. Crown rust disease and barley yellow dwarf virus disease symptoms were scored on each plot at Ames and levels of susceptibility or resistance were estimated from the scores. All disease ratings from Iowa reflect reactions under natural infestations, which can vary from site-to-site and year-to-year. In addition, two replicates of each entry were grown in a nursery artificially inoculated with barley yellow dwarf virus at the University of Illinois-Urbana. Barley yellow dwarf virus disease symptoms were scored on the same scale at that nursery and average scores over the two environments were calculated to estimate each variety's level of susceptibility or tolerance to the disease.

How Barley Tests Are Conducted

Spring barley tests were conducted at three locations in Iowa: near Ames (planted March 14, harvested July 12), near Calumet (planted March 28, harvested July 21), and Nashua (planted March 30, harvested July 18). Twelve barley varieties were tested in 2000. Each variety was replicated in three plots at each location, and each plot occupied 32 square feet of land. Plots consisted of four rows spaced one foot apart, drill-seeded at rates approximating two bushels per acre. Management of barley trials was similar to management of oat trials described previously.

Grain yield, grain test weight, and straw yield of each variety was recorded at each location. In addition, each plot at Ames was rated for heading date, and measured for plant height.

Oat Test Results

The results of the oat test for 2000 are presented in Table 1. Averages of each trait over the different locations are given. In addition, yield averages from each testing location are presented because some varieties yield relatively better in certain regions of the state than others. The state-wide yield average for all varieties in the tests was 93.2 bu./A, and ranged from 117.5 bu./A in the central location to 71.2 bu./A at the northwestern location

Yield results from a single year are not entirely reliable. Environmental and disease conditions fluctuate greatly from year to year, so it is important to consider yields averaged over a number of years. Table 2 presents regional and statewide yield averages for two time periods: 1997-00 and 1999-00. In addition, agronomic trait means from the period 1997-2000 are presented.

Yields reported are based on 32 lb./bushel test weights. Test weight is the most important indicator of grain milling quality. Minimum test weights are 36 lb./bu. for U.S. No. 1 oats and 33 lb./bu for U.S. No. 2 oats.

Barley Test Results

The average results from 2000 alone and from four years of testing (1997-2000) barley varieties are presented in Table 3. The 2000 average yield of barley varieties in the test was 66.1 bu./A. The 2000 average test weight was 54.5 lb./bu. Barley yields reported are based on 48 lb./bu test weights.

New Oat and Barley Varieties

Several recently released oat varieties were tested in Iowa in 2000:

“Killdeer” has mid-late season maturity, medium plant height, with moderate crown rust resistance and was developed at North Dakota State University.

“Jay” is an oat adapted throughout the midwest and upper midwest regions of the U.S. Resistant to prevalent cultures of crown rust and has resistance/tolerance to barley yellow dwarf virus.

Midseason in maturity, excellent lodging resistance, light tan grain color, high test weight and relatively high percent groat protein. Jay was developed at Purdue University.

“Ebeltoft” was released by North Dakota State University in 1999. It is off white, late maturing, and is moderately resistant to crown rust and barley yellow dwarf virus.

“Youngs” is a tall, late maturing white seeded variety released by North Dakota State University in 1999. It is moderately susceptible to crown rust and barley yellow dwarf virus.

No new barley varieties were tested.

Specialty Oat Varieties

"Paul" is a hull-less oat. When hull-less oats are harvested and threshed, the groat separates freely from the hull. Hull-less oats generally produce lower yields because the weight of the hull is not included in their grain yield weights. Hull-less oats have higher feed value per bushel than normal types of oats.

Certified Oats

“AC Stewart”, “Blaze”, “Chaps”, “Classic”, “Dane”, “Don”, “Gem”, “INO9201”, “Jay”, “Jerry”, “Jim”, “Ogle”, “Riser”, and “Starter” varieties of oats were grown for certified seed in Iowa in 2000.

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Table 1. Performance of oat varieties tested in Iowa in 2000.

Variety	Grain Yields ¹						Test Weight lbs/bu	Straw Yield T/A	Heading Date (June)	Plant Height (in.)	Groats %	Diseases ²		State of Origin
	SW	SE	Cen. bu/A	NE	NW	Avg.						BYD	Crown Rust	
Early														
Cherokee	38.3	62.7	52.6	70.4	47.4	52.4	31.1	3.3	5/29	33	68.0	S	S	IA
Dane	85.8	93.3	114.9	111.4	70.3	98.2	29.8	3.2	5/26	34	72.0	MR	MR	WI
Don	86.6	86.9	119.3	81.4	77.4	92.2	34.3	3.3	5/30	31	69.0	MS	S	IL
IN09201	89.7	107.9	121.0	90.0	76.3	99.7	32.6	3.1	5/30	32	69.0	MR	R	MI
Jim	86.3	106.2	120.9	103.1	83.0	100.6	33.4	4.0	5/31	35	72.0	MR	MR	MN
Multiline E77	39.8	54.4	52.3	58.4	43.5	49.0	31.5	2.9	5/28	37	66.0	S	S	IA
Riser	63.8	97.8	83.7	99.1	56.1	81.6	33.5	3.1	5/24	33	72.0	S	MS	SD
Sheldon	70.0	85.5	101.9	89.6	69.8	83.4	32.4	3.2	5/30	34	69.0	MS	S	IA
Starter	77.4	83.1	85.9	82.3	53.0	81.2	33.7	3.0	5/30	32	72.0	S	S	MN
Midseason														
Blaze	92.9	112.2	129.4	98.8	81.9	105.2	33.7	3.2	2	33	71.0	MR	R	IL
Brawn	107.3	111.9	164.0	101.0	79.7	118.3	31.5	3.3	2	32	71.0	MR	MR	IL
Burton	73.0	98.9	141.6	89.4	75.2	95.2	31.4	3.6	2	34	69.0	S	MS	OH
Chaps	94.2	116.7	130.0	111.8	77.4	109.4	32.0	3.0	1	35	72.0	MR	MR	IL
Classic	82.4	102.9	121.8	91.4	70.9	96.1	33.0	3.1	1	35	70.0	R	R	IN
Gem	96.1	104.1	128.2	94.6	77.3	103.8	32.4	3.3	5	36	69.0	MR	MR	WI
Ida	98.6	112.5	137.9	71.2	82.0	103.8	31.7	3.1	4	34	67.0	MR	MR	IN
Jay	88.2	109.8	119.0	98.9	75.5	100.8	34.1	4.1	1	31	68.0	MS	R	IN
Jerry	89.7	105.0	119.5	82.6	71.8	97.3	35.0	3.3	3	35	71.0	MS	MS	ND
Jud	88.5	111.9	122.9	107.0	77.8	103.7	33.1	3.8	6	37	71.0	S	MR	ND
Milton	70.2	102.1	135.6	92.2	67.5	94.1	31.7	3.3	5	34	69.0	S	MR	MN
Ogle	94.5	105.7	124.0	92.8	82.9	102.3	30.9	3.9	1	34	71.0	MR	MR	IL
Richard	84.5	100.4	115.3	97.5	70.3	96.4	31.4	3.6	3	38	68.0	S	MS	MN
Richland	29.3	51.9	63.4	61.3	44.9	47.0	29.5	2.5	1	33	67.0	S	S	IA
Rodeo	90.4	115.8	141.8	99.3	86.1	107.6	31.3	3.3	4	35	70.0	MR	R	IL
Vista	93.9	102.0	98.1	93.8	74.6	96.3	32.7	3.2	4	36	70.0	MS	R	WI

Variety	Grain Yields ¹						Test Weight lbs/bu	Straw Yield T/A	Heading Date (June)	Plant Height (in.)	Groat %	Diseases ²		State of Origin
	SW	SE	Cen. bu/A	NE	NW	Avg.						BYD	Crown Rust	
Late														
Belle	89.4	88.6	115.7	87.8	64.1	94.2	33.4	3.7	6	36	74.0	S	R	WI
Ebeltoft	80.5	120.5	157.0	93.0	76.7	106.3	31.5	3.7	10	34	70.0	MR	MS	ND
Killdeer	88.0	100.0	140.9	115.7	77.5	106.5	32.3	3.7	6	34	70.0	MS	R	ND
Loyal	80.4	102.7	105.1	82.1	73.1	90.1	33.1	3.4	7	35	69.0	MR	S	SD
Paul	52.2	72.8	101.7	58.9	53.8	67.6	40.9	3.7	9	38	100.0	MS	R	ND
Troy	85.2	105.1	133.2	84.5	73.7	98.6	32.2	3.6	9	38	69.0	MS	MR	SD
Valley	81.2	92.3	139.8	85.1	79.8	95.9	33.3	3.8	9	33	69.0	S	MS	ND
Youngs	79.3	92.7	140.6	107.6	77.9	99.9	31.3	3.6	9	39	69.0	S	MS	ND
Average	80.2	97.5	117.5	90.4	71.2	93.2	32.6	3.4	3	35	71.0			
LSD (0.05) ³	20.6	10.5	23.3	18.4	9.3	12.9	1.3	0.7	1	2	3.0			

¹ Grain yields are based on 32lb./bu. test weight.

² Crown rust and BYD data from 1999.

³ LSD = Least significant difference. When entries differ by an amount equal to one LSD or more, they are considered to be in different classes with 95% certainty.

Table 2. Performance of oat varieties tested in Iowa during the years 1997-00 and 1999-00.

Variety	Averaged Over 1997-00 or 1999-00 ¹											Traits Averaged Over 1999-00						
	Southwest		Southeast		Central		Northeast		Northwest		State Average		Test	Straw	Head.	Plant	Lodg. ²	Groats
	97-00	99-00	97-00	99-00	97-00	99-00	97-00	99-00	97-00	99-00	97-00	99-00	Wgt lbs/bu	Yield T/A	Date (June)	Hgt (in.)		
Early																		
Cherokee	70.4	53.6	58.0	53.2	77.7	60.3	79.0	73.3	80.9	67.8	70.4	58.3	32.0	3.1	1	37	38	70.3
Dane	108.7	97.1	109.4	112.5	119.0	107.0	114.3	109.2	115.0	105.3	111.5	105.0	31.3	3.0	5/29	36	18	74.6
Don	111.3	94.6	99.0	95.5	118.4	109.7	101.2	90.8	109.8	93.7	106.8	97.0	34.4	3.0	1	33	58	70.9
IN09201	116.3	94.2	115.2	117.1	128.6	125.0	111.4	101.0	122.5	112.4	116.5	108.1	33.6	3.2	1	35	42	71.4
Jim	124.6	103.2	113.7	110.9	124.3	119.0	116.4	109.9	127.1	115.6	118.4	109.0	34.0	3.6	2	38	48	74.1
Multilin E77	64.5	46.2	55.8	52.7	71.7	57.1	76.7	71.8	83.5	66.6	67.3	55.9	32.2	3.6	5/31	39	48	69.3
Riser	94.5	81.3	93.2	96.8	99.4	83.4	109.7	103.5	103.3	87.0	97.9	89.0	33.2	3.0	1	36	65	73.0
Sheldon	104.7	81.3	97.0	96.9	114.9	103.0	108.4	96.9	108.9	88.5	105.3	92.9	32.4	3.3	2	38	75	70.1
Starter	103.3	83.1	93.1	95.5	97.5	91.0	98.9	91.8	97.7	78.6	97.7	89.9	34.5	3.0	1	35	65	73.3
Midseason																		
Blaze	121.3	100.6	113.8	119.0	143.9	131.2	118.6	106.7	132.0	105.8	124.4	112.9	34.3	3.3	3	36	54	73.6
Brawn	131.1	113.8	110.7	117.4	146.3	156.5	112.6	106.1	129.9	113.4	124.4	122.1	32.4	3.6	4	34	39	73.2
Burton	102.5	85.2	94.5	93.5	126.3	127.3	104.6	101.2	115.1	97.6	105.7	99.1	32.5	3.8	4	36	43	70.1
Chaps	119.8	101.3	111.9	111.9	136.4	128.5	118.0	109.2	122.5	105.7	120.2	110.8	32.8	3.3	4	39	43	74.1
Classic	117.3	102.9	109.7	115.2	132.9	121.9	114.8	102.5	117.7	104.4	117.0	108.9	33.6	4.1	4	38	42	70.8
Gem	117.5	98.4	101.8	108.6	127.9	120.6	111.7	107.4	119.4	109.7	113.8	107.7	33.5	4.0	6	38	28	70.7
Ida	110.2	93.7	107.7	109.8	128.2	130.0	98.0	86.4	123.7	107.5	110.8	104.4	32.0	3.3	7	39	47	69.4
Jay	119.9	106.8	113.7	121.5	136.7	127.5	117.7	106.2	122.2	110.0	120.7	114.0	34.7	3.7	4	34	35	71.3
Jerry	113.0	100.3	102.4	105.1	121.9	112.7	107.5	95.5	116.0	95.6	110.6	102.5	35.5	4.0	4	41	49	72.5
Jud	112.3	91.1	112.4	117.1	130.4	117.5	109.7	103.8	120.8	107.3	114.9	105.5	34.2	3.7	7	40	35	71.9
Milton	106.5	87.0	95.9	104.5	131.4	122.3	112.9	102.5	112.8	94.5	110.0	101.1	31.9	3.3	7	36	45	70.3
Ogle	118.5	99.4	112.6	117.8	130.4	121.0	111.6	100.5	122.8	105.9	117.7	108.7	31.7	3.6	3	38	46	72.9
Richard	.	88.5	.	89.4	.	115.7	.	103.7	.	99.1	.	97.9	31.9	3.6	4	41	28	69.7
Richland	58.7	40.3	49.6	43.9	82.7	67.7	69.5	62.2	73.4	56.5	64.1	51.4	30.4	2.2	2	35	56	70.4
Rodeo	122.9	98.8	112.3	114.3	138.0	130.9	117.7	109.0	132.0	112.8	121.9	111.2	31.6	3.2	6	39	38	71.8
Vista	105.0	93.7	89.9	94.9	118.5	96.5	115.9	107.2	120.4	103.9	107.3	97.8	33.2	3.9	6	41	44	70.3

Variety	Averaged Over 1997-00 or 1999-00 ¹												Traits Averaged Over 1999-00					
	Southwest		Southeast		Central		Northeast		Northwest		State Average		Test	Straw	Head.	Plant	Lodg.	Groats
	97-00	99-00	97-00	99-00	97-00	99-00	97-00	99-00	97-00	99-00	97-00	99-00	Wgt	Yield	Date	Hgt		
bu/A												lbs/bu	T/A	(June)	(in.)			
Late																		
Belle	109.4	93.1	90.9	93.5	115.3	96.3	103.5	101.4	116.8	103.0	104.0	95.6	34.1	3.6	3	40	28	74.0
Ebeltoft	.	101.9	.	121.3	.	147.5	.	106.5	.	113.9	.	116.0	32.6	3.7	6	36	34	71.5
Killdeer	.	100.8	.	103.0	.	134.0	.	111.2	.	111.8	.	110.0	32.8	3.5	7	37	37	71.6
Loyal	.	89.9	.	96.5	.	98.5	.	96.3	.	104.7	.	94.1	33.9	3.3	8	39	27	70.2
Paul	68.1	61.3	50.5	64.1	95.7	101.8	67.6	64.4	83.1	74.3	70.1	71.0	42.0	3.3	5	41	27	100.0
Troy	105.2	90.2	93.0	104.1	119.4	116.1	97.3	96.7	120.5	99.2	104.1	100.1	33.3	3.6	9	40	79	70.5
Valley	107.1	85.1	86.7	83.0	128.3	120.9	102.2	82.5	118.9	94.0	105.4	91.1	33.0	3.4	3	36	60	69.5
Youngs	.	93.6	.	88.9	.	134.3	.	111.3	.	108.7	.	104.5	31.8	3.4	9	41	36	71.0
Average	105.9	89.4	96.2	99.0	119.3	113.1	104.5	97.8	113.2	98.6	105.7	98.3	33.2	3.4	4	37	43	72.4
LSD (0.05) ³	11.7	17.8	15.3	22.6	18.0	21.3	12.3	16.5	14.7	19.5	9.2	10.6	1.2	1.1	6	3	26	2.5

¹ Grain yields are based on 32 lb./bu. test weight.

² Lodging data recorded in 1999.

³ LSD = Least significant difference. When entries differ by an amount equal to one LSD or more, they are considered to be in different classes with 95% certainty.

Table 3. Performance of spring barley varieties tested in Iowa during 1998-2000.

Variety	2000 averages			1998-00 averages						
	Grain Yield ¹ (bu/A)	Heading Date ² (May)	Plant Height ² (in.)	Grain Yield ¹ (bu/A)	Test Weight (lbs/bu)	Heading Date ² (June)	Plant Height ² (in.)	Straw Yield (T/A)	1996 Lodging %	State of origin
Azure	73.6	25	31	63.2	49.0	2	32	3.1	4	ND
Bonanza	70.5	28	36	63.1	50.8	4	36	2.5	10	- ³
Bowers	61.0	27	33	66.6	51.4	3	33	2.4	7	WI
Chilten	53.4	26	32	56.0	52.4	3	34	2.1	3	WI
Excel	73.2	25	29	67.0	51.9	2	30	2.2	3	MN
Hazen	70.4	27	32	63.6	51.3	3	32	1.9	1	ND
Kewaunee	73.8	27	32	65.0	50.1	3	33	2.3	-	WI
MNBrite	68.2	26	30	64.8	53.0	3	31	2.0	-	MN
PrimusII	50.6	19	30	55.8	52.0	5/28	31	2.3	13	SD
Robust	69.3	25	31	65.8	53.0	3	32	2.4	2	MN
Royal	64.2	29	27	61.0	51.8	5	25	1.9	2	MN
Stander	65.7	25	28	62.3	51.9	3	28	2.0	0	MN
Average	66.1	26	31	62.9	51.6	3	31	2.3	5	
LSD(0.05) ⁴	5.7	1	1	11.7	1.1	3	2	0.4	6	

¹ Grain yields are based on 48lb./bu. test weight.

² Data collected at Ames only.

³ Entry from Brandon, Manitoba, Canada.

⁴ LSD = Least significant difference. When entries differ by an amount equal to one LSD or more, they are considered to be in different classes with 95% certainty.