



KERR WINTER BARLEY

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Kerr Winter Barley

By

L. H. Edwards, E. L. Smith, H. Pass and E. A. Wood¹

Kerr winter barley is a stiff-strawed, high test weight variety that is winterhardy, tolerant to greenbugs, and resistant to powdery mildew. Kerr is very similar to Rogers in most agronomic characteristics; however, it is superior to Rogers in winterhardiness and exhibits greenbug tolerance which Rogers lacks. Kerr has a greater test weight and less broken stem lodging than Will.

Kerr was developed in the small grains breeding program conducted cooperatively by the Oklahoma Agricultural Experiment Station and the United States Department of Agriculture. It was released in 1969.

Seed Availability

Breeder's seed of Kerr barley was released for increase to Oklahoma Foundation Seed Stocks, Inc., Oklahoma State University, Stillwater, for planting in the fall of 1969. Foundation seed was available through Foundation Seed Stocks for planting in the fall of 1970 for production of pedigreed seed. Certified seed should be available for commercial plantings in the fall of 1971.

Origin and History

Kerr (C.I. 11664) winter barley resulted from a cross between Rogers (C.I. 9174) and Omugi (C.I. 5144) made at Oklahoma State University in 1952. The origin and description of Rogers is given by Schlehuber et al. (3). Omugi is an introduction from Korea which has been used in genetic and breeding research but has not been released as a commercial variety.

Kerr was developed by the bulk hybrid method of breeding. The F₂ and F₃ populations were grown during years when winter-killing eliminated a majority of the segregates with a winterhardiness level equal to or below that of Rogers. Kerr originated from a single head selection in

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the F₅ generation. It was assigned the selection number Stw582637 in 1958. The F₇ progenies tracing to the selection made in the F₅ were tested for greenbug tolerance and all susceptible plants were eliminated. Kerr has been grown in the Oklahoma Winter Barley Variety Tests at several locations for the past seven years. It has also been tested in the Winter Barley Greenbug-Yield Nursery, the Uniform Barley Winterhardiness Nursery, and the Uniform Winter Barley Nursery (Hardy Varieties).

Breeders seed was produced from plant selections obtained from a space-planted seed increase nursery grown in 1965. Progenies were evaluated and offtype plants eliminated in 1966, 1967, and 1968. One hundred ninety-two progenies were bulked in 1968 and furnished seed for a six-acre increase in 1968-69. Seed harvested from this increase was supplied to Oklahoma Foundation Seed Stocks, Inc.

Description

Kerr is a six-rowed, rough-awned, mid-tall winter barley variety that matures midseason to late. When seeded in the fall, early plant growth is semi-prostrate. Basal leaf sheaths are hairy and auricles are green on immature plants. The exposed nodes are green when immature and stems are yellow at maturity. Spikes are lax to dense, parallel and mid-long. Collars are usually closed. The rachis internodes are 2.5 to 3.5 mm long with long-haired edges. The lemma awns are long and rough. Glumes are approximately one-half the length of the lemma and are covered with long hairs. Kernels are white to light blue, midlong with few lemma teeth on the lateral and marginal nerves. Rachilla hairs are long and rachillas often abort. Hulls are slightly wrinkled to semi-wrinkled.

Table 1. Distinguishing Morphological Characteristics of Kerr, Will and Rogers.

Character	Kerr	Will	Rogers
Hairiness of basal leaf sheath	Hairy	Non-hairy	Non-hairy
Hairiness of rachis edges	Many-long	Many-short	Many-short
Rachis internode length	2.5-3.5 mm	1.5-2.5 mm	2.0-3.0 mm
Rachis internode width	Wide	Wide	Narrow
Hairiness of glumes	Many-long	Many-short	Many-short
Rachilla hairs	Long	Short	Short
Rachilla abortion	Often	Seldom	Seldom
(prior to threshing)			
Greenbug reaction	Resistant	Resistant	Susceptible

Greenbug Tolerance

Differences in tolerance of barley varieties to greenbugs was noted by Atkins and Dahms in 1945 (1). Since all tolerant strains were low yielding, weak-strawed types, adapted varieties were developed by hybridization. Will (2) was the first variety of winter barley developed with greenbug tolerance as an objective. Kerr obtained its greenbug tolerance from the Omugi parent. Part of this tolerance is due to the fact that greenbugs are less attracted to Kerr and cannot reproduce as well as they can on susceptible varieties.

Field experiments conducted at Stillwater in 1964 and 1965 assessed the performance of Will, Kerr, and Rogers under greenbug infested and controlled conditions. The tests were arranged in a split-plot design with three replications each year. Half of the plots were uniformly infested with greenbugs on three occasions during the growing season. The other half were sprayed periodically to control infestations of greenbugs. The data listed in Table 2 are average data from the two years.

Average numbers of greenbugs observed on each variety throughout the tests were 58, 56, and 87 for Will, Kerr, and Rogers, respectively. The greenbugs moved from the tolerant varieties to Rogers and destroyed most of the plants in the Rogers plots.

Table 2. Agronomic data for Will, Kerr, and Rogers grown in greenbug infested and control nursery plots at Stillwater, Oklahoma in 1964 and 1965.

Character	Variety		
	Kerr	Will	Rogers
Yield (Bu/A)			
Control	71.2	78.0	66.4
Infested	68.2	77.5	7.5
Test weight (lbs/Bu)			
Control	49.0	48.9	49.6 ¹
Infested	49.7	48.2	44.6 ¹
Heads per plot			
Control	754	597	645
Infested	721	555	79
Seeds per head			
Control	27.5	37.6	33.6
Infested	26.1	40.6	23.4
Seed weight (mg)			
Control	31.3	31.0	31.5
Infested	32.6	30.9	28.6
Date headed			
Control	5-2	4-29	5-1
Infested	5-3	4-20	5-3
Height (inch)			
Control	30	29	29
Infested	29	30	24

¹Test weight of Rogers obtained only in 1964 test.

In addition to low yields the infested plots of Rogers had lower test weights, fewer heads per plot, fewer seeds per head, lower seed weight, and later and shorter plants. Greenbugs affected Will and Kerr much less than Rogers for all characteristics; however, there was a slight decrease in yield, heads per plot, and heading date in infested plots of these two varieties. The decrease in heads per plot appears to be almost completely compensated for by an increase in seeds per head for Will and seed weight for Kerr. The test-weight of infested Kerr also increased over the control.

Yield

The grain yield produced by Kerr, Will, and Rogers for 32 station years in the Oklahoma State-wide Tests are presented in Table 3. Kerr yielded 4.5 bushels per acre less than Will on the 43 station average. It yielded 1.3 bushels per acre less than Rogers in the same tests; however, Kerr outyielded Rogers in 50 percent of the tests. Kerr had a distinct advantage over Rogers in yield in years when winterkilling occurred. No heavy infestations of greenbugs occurred during these tests. If greenbug infestations had occurred, Kerr would probably have exceeded Rogers in average yield. The performance of Kerr in both the State-wide and Variety tests indicates its adaptability to all sections of Oklahoma.

Table 3. Average grain yields (bushels/acre) of Kerr (C.I. 11664), Will (C.I. 11652), and Rogers (C.I. 9174) in the Oklahoma yield tests, 1962-68.

Variety	Stillwater ¹ 1962-68	Woodward 1962-68	Cherokee 1963-68	Goodwell ² ³ 1963-68	Granite 1962-63	Muskogee 1965-68	Altus 1966-67
Kerr	54.7	48.2	48.9	65.5	14.5	37.8	46.7
Will	60.5	54.1	55.4	66.9	22.2	37.2	49.4
Rogers	53.0	48.1	51.9	65.3	15.8	40.6	51.7

Average

Variety	Oklahoma Variety Tests 32 Sta. Yrs.	Okla. State ⁴ Wide Tests 11 Sta. Yrs.	43 Sta. Yrs.
Kerr	49.1	49.3	49.2
Will	53.7	53.8	53.7
Rogers	50.0	51.8	50.5

¹Nursery destroyed by hail in 1967. Not included in averages.

²Erratic stand in 1964. Not included in averages.

³Nursery received supplemental irrigation.

⁴Data from Oklahoma State Wide Tests for 1964 only.

Winterhardiness

Winterkilling in Oklahoma has not been a problem in the past few years; however, comparative data from five stations in 1963 (Table 4) showed that Kerr survived 76 percent, Will 81 percent and Rogers 41 percent. Both Kerr and Will appear to be substantially more winterhardy than Rogers. Data from Table 5 indicate that Kerr is equal to or slightly better than Will in winterhardiness. These data represent survival results from 33 states and Canada over a period of several years. Kearney and Reno served as two of the winterhardy checks in these tests. Will averaged 61.9 percent survival from 1961 to 1963; whereas Kerr averaged 60.7 percent survival from 1964 to 1967. However, Will only survived 81.0 percent as well as Kearney, while Kerr survived 83.5 percent as well as Kearney.

Table 4. Winter survival (%) of Kerr (C.I. 11664), Will (C.I. 11652), and Rogers (C.I. 9174) in the Oklahoma Variety Tests, 1963.

Variety	Stillwater	Woodward	Cherokee	Goodwell	Granite	Average
Kerr	89	14	92	94	90	76
Will	91	25	93	98	99	81
Rogers	41	2	28	50	85	41

Table 5. Winter survival of Kerr (C.I. 11664) and Will (C.I. 11652) when compared with winter hardy varieties grown in the uniform barley winterhardiness nurseries.¹

Variety	1961-63, Average of 142 Station Years		1964-67, Average of 106 Station Years	
	% Survival	% of Kearney	% Survival	% of Kearney
Kearney	76.4	100	72.8	100
Reno	70.2	91.9	66.8	91.8
Will	61.9	81.0	²	—
Kerr	²	—	60.7	83.4

¹Reid, D. A. (Compiler) Winter Barley Nursery (Hardy Varieties) and Barley Winterhardiness Nursery (1961-68). U. S. Dept. Agri., ARS, Crops Research Division.

²Will was grown in this nursery from 1961 to 1963; whereas, Kerr was grown from 1964 to 1967. Since Will and Kerr were not grown in the same years, Kearney and Reno are included for comparison.

Test Weight

Comparative test weight data are shown in Table 6. The average test weight of Kerr is 0.8 pounds per bushel greater than the test weight of Rogers and 2.6 pounds per bushel greater than the test weight of Will. Both Kerr and Rogers appear to have plumper kernels than Will.

Table 6. Average test weights (pounds/bushel) of Kerr (C.I. 11664), Will (C.I. 11652), and Rogers (C.I. 9174) in the Oklahoma yield tests, 1962-1968.

Variety	Stillwater ¹ 1962-68	Woodward 1962-68	Cherokee 1962-68	Goodwell ^{2,3} 1963-68	Granite 1962-63	Muskogee 1965-68	Altus 1966-67
Kerr	48.3	47.5	47.4	48.5	48.0	44.8	49.3
Will	46.2	46.1	45.2	47.7	43.5	42.1	46.3
Rogers	48.2	47.4	47.6	49.2	45.2	43.5	47.0

Average

Variety	Oklahoma Variety Tests 32 Sta. Yrs.	Okl. State ⁴ Wide Tests 11 Sta. Yrs.	43 Sta. Yrs.
Kerr	47.7	49.0	48.0
Will	45.6	44.8	45.4
Rogers	47.3	46.9	47.2

¹Nursery destroyed by hail in 1967. Not included in averages.

²Erratic stand in 1964. Not included in averages.

³Nursery received supplemental irrigation.

⁴Data from Oklahoma State Wide Tests for 1964 only.

Maturity

In the Oklahoma variety tests conducted from 1962 through 1968, Kerr averaged one day later in heading than Rogers and three days later than Will (Table 7). Kerr ranged from two days earlier to seven days later than Will in individual tests; however, in location averages Kerr was always later than Will. Kerr headed on the same average dates as Rogers at Stillwater and Cherokee but headed later at the other locations.

Table 7. Average dates of heading of Kerr (C.I. 11664), Will (C.I. 11652), and Rogers (C.I. 9174) in the Oklahoma Variety Tests, 1962-68.

Variety	Stillwater 1962-68	Woodward 1962-68	Cherokee 1962-68	Goodwell 1963-68	Granite 1962-63	Muskogee 1965-68	Altus 1966-67	32 Sta. Average
Kerr	4-29	5-4	5-3	5-5	4-25	4-27	4-24	5-1
Will	4-26	5-1	4-29	5-3	4-23	4-24	4-21	4-28
Rogers	4-29	5-2	5-3	5-3	4-23	4-26	4-22	4-30

Height and Lodging

Data in Table 8 show no differences in average height when Kerr, Will, and Rogers are compared. The straw of Kerr appears to lean more than that of Rogers; however, both Kerr and Rogers appear to have fewer

Table 8. Average height (inches) of Kerr (C.I. 11664), Will (C.I. 11652), and Rogers (C.I. 9174) in the Oklahoma Variety Tests, 1962-68.

Variety	Stillwater ¹	Woodward	Cherokee	Goodwell ^{2,3}	Granite	Muskogee	Altus ³	31 Sta.
	1962-68	1962-68	1963-68	1963-68	1962-63	1967-68	1966-68	Average
Kerr	28	24	28	31	21	38	32	28
Will	29	25	29	30	20	34	30	28
Rogers	29	25	29	31	20	35	31	28

¹Nursery destroyed by hail in 1967. Not included in averages.

²Erratic stand in 1964. Not included in averages.

³Nursery received supplemental irrigation.

broken stems than Will. Broken stem lodging is believed to be caused by a combination of high winds and moisture stress during the heading period and appears to be associated with varieties that produce an abundance of tillers.

Forage Production

Data on forage production are presented in Table 9. Kerr produced more total forage than Will or Rogers in these tests. However, in the hand-clipped test, Will produced more forage than Kerr or Rogers. The hand-clipped tests tend to favor Will because of its more procumbent growth habit. Kerr and Rogers are more upright in growth habit; thus, are favored by the mower-clipped tests. From the data on forage production, Kerr appears to be equal to or better than Will and superior to Rogers.

Table 9. Forage yields (pounds/acre of oven dry forage) of Kerr (C.I. 11664), Will (C.I. 11652), and Rogers (C.I. 9174).

Variety	Mower- ¹ Clipped	Hand- ² Clipped	Average 8-Tests
Kerr	4196	1716	2956
Will	3513	2133	2823
Rogers	3518	1879	2699

¹Data from tests at Muskogee, Mangum, and Goodwell (2 years) conducted by Mr. C. E. Denman. Total forage as measured by 4 to 8 clippings on different dates.

²Data from tests at Stillwater (2 years), Altus, and Muskogee conducted by Mr. H. Pass. Average forage as measured by 4 observations taken on one date.

Disease Resistance

Kerr, Will, and Rogers are highly resistant to powdery mildew caused by *Erysiphe graminis* DC., which occurs naturally in Oklahoma.

Kerr has had little natural infection with loose smut. It appears to have resistance to some races of *Ustilago nuda* like Rogers. Kerr, like Will, is susceptible to leaf rust caused by *Puccinia hordei* Otth.; however, this disease is seldom a limiting factor to barley production in Oklahoma. Kerr appears to be more resistant than Will or Rogers to spot blotch.

Literature Cited

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