

# GLENN and PARK

## New Barley Varieties for North Dakota

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Two barley varieties, 'Glenn' and 'Park', have been developed by the North Dakota Agricultural Experiment Station in cooperation with the Agricultural Research Service, US Department of Agriculture. Glenn is a high yielding, early maturing, strong strawed variety with resistance to loose and covered smut. Glenn has not yet been classified with respect to acceptability for malting and brewing but tests have been generally favorable. Park is a strong strawed variety with superior resistance to prevalent leaf spotting diseases. Park has been classified as an acceptable variety for malting and brewing by the Malting Barley Improvement Association.

The Director of the North Dakota Agricultural Experiment Station in cooperation with the Agricultural Research Service, US Department of Agriculture, announced the release of two new barley varieties on January 12, 1978. Seed increase of 'GLENN' (C.I. 15769) and 'PARK' (C.I. 15768) is being made in most counties in North Dakota in 1978 under contract with the North Dakota Agricultural Experiment Station. No seed of these varieties will be available for commercial production in 1978. Seed allocations of GLENN and PARK also will be made to the North Dakota seed trade and interested states in the region.

Hybridization, selection, and development of GLENN and PARK were done at North Dakota State University through cooperation of the departments of Agronomy, Cereal Chemistry and Technology, and Plant Pathology. Also, Branch Experiment Stations in North Dakota, cooperating states in the region, the USDA National Barley and Malt Laboratory at Madison, Wisconsin, and industry laboratories under the auspices of the Malting Barley Improvement Association, collaborated in the testing of these two barley varieties. The crossing, early selection, and initial yield testing of these varieties was directed by the late Glenn A. Peterson, for whom the variety GLENN is named. Glenn Peterson was a native of Oberon, N.D., an agronomy graduate of NDSU, and had been barley breeder at North Dakota State University from 1957 until his death in 1974. During his tenure, the varieties 'Larker', 'Trophy', 'Dickson', 'Nordic', and 'Beacon' were released.

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### History of GLENN Barley

GLENN is a selection from the cross Br5755-3/Trophy/ /NDB138 made in the 1967 spring greenhouse. Br5755-3 is an experimental line developed at the Experiment Station at Brandon, Manitoba, Canada, which has resistance to loose and covered smuts. NDB138 is a North Dakota experimental with good yield and resistance to leaf spotting diseases. Early generations of GLENN were grown at Fargo in greenhouses or field and Cd. Obregon, Sonoro, Mexico. A single F<sub>3</sub> plant was selected in 1968 and the F<sub>4</sub> row was bulked to provide seed for yield tests starting in 1969 in North Dakota. GLENN was entered in regional tests in 1972. GLENN was tested under the number ND718.

### Agronomic Characteristics of GLENN

GLENN is a six-rowed, rough-awned, spring barley with colorless aleurone and long rachilla hairs. Agronomic comparisons of GLENN with Larker at several North Dakota locations during 1969-77 are presented in Table 1.

**Table 1. Agronomic Performance of GLENN Compared with Larker at Several Locations in North Dakota in 1969-77.**

Characteristics	No. of Station Years	Larker	Glenn
Yield, bu/A	53	76.4	82.6
Days to heading after May 31	47	27.8	26.1
Height, inches	52	31.9	31.1
Lodging, %	15	48	32
Test weight, lbs/bu	25	49.2	48.0

The average grain yield of GLENN has exceeded that of Larker in North Dakota and regional tests. The yield advantage of GLENN over Larker is greatest in eastern North Dakota and less in western North Dakota. GLENN has yielded exceptionally well in some irrigated trials. In addition to higher yield, GLENN has the advantages of earlier matur-

ity and stronger straw than Larker. GLENN and Larker are nearly equal in height. The test weight of GLENN is lower than that of Larker.

### Disease Reaction of GLENN

GLENN can be compared to Larker for reaction to several diseases using the disease data in Table 2, taken at several North Dakota locations. GLENN is somewhat more resistant than Larker to the leaf spotting diseases, spot blotch, net blotch, and Septoria leaf blotch. However, the resistance of GLENN to these diseases is not as good as that of PARK. GLENN has the advantage, over both Larker and PARK, of being resistant to prevalent races of loose and covered smut, and therefore does not require fungicide treatment for their control. GLENN, like Larker and PARK, is resistant to stem rust and susceptible to leaf rust.

**Table 2. Reaction of GLENN and Larker to Prevalent Diseases in North Dakota in 1969-77.**

Characteristic	No of Station years	Larker	Glenn
Leaf spot, 1-10*, **	3	6.8	5.2
Net blotch, 1-10**	4	2.5	2.0
Septoria, 1-10**	4	6.3	4.5
Spot blotch**	4	3.6	1.6
Loose smut	—	Susc.	Res.
Covered smut	—	Susc.	Res.

*Disease notes taken at selected locations where good differential readings could be obtained.*

\*Includes foliar diseases (spot blotch, net blotch, Septoria leaf blotch).

\*\*1 = no symptoms, 10 = severe symptoms.

### History of PARK Barley

PARK is a selection from the cross Dickson/3/CI4738//Traill/UM570/4/NDB133 made in the 1966 summer greenhouse at Fargo, North Dakota. CI4738 is an introduction from the Peoples Republic of China which has resistance to Septoria leaf blotch. NDB133 is a North Dakota experimental line with good resistance to spot and net blotch. The greenhouse, growth chambers, field and southern increase at Cd. Obregon, Sonora, Mexico all were utilized to quickly advance the material to the yield testing stage. Seed of PARK was bulked in the F<sub>4</sub> generation and traces to a single F<sub>3</sub> plant. Performance trials were started in 1968 in North Dakota and regionally in 1972. PARK was tested under the number ND231. Purification of seedstocks for awn type and rachilla hair length was done in the F<sup>12</sup> generation. The name "PARK" is taken from the river of the same name which traverses the important barley growing area in northeast North Dakota.

### Agronomic Characteristics of PARK

PARK is a six-rowed, rough-awned, spring barley with colorless aleurone and short rachilla hairs. Agronomic comparisons of PARK with Larker at several North Dakota locations during 1968-77 are presented in Table 3.

**Table 3. Agronomic Performance of PARK compared with Larker at Several Locations in North Dakota in 1968-77.**

Characteristic	No of Station Years	Larker	Park
Yield, bu/A	57	75.4	76.5
Days to heading after May 31	50	28.3	29.3
Height, inches	56	32.2	32.8
Lodging, %	17	44	35
Test weight, lbs/bu	25	49.2	48.9

The average grain yield of PARK has been similar to Larker in North Dakota tests. PARK is equal in height and slightly later in heading date than Larker. The straw strength of PARK is one of its advantages, since it lodges less than Larker, Dickson, or Nordic, but is similar to Beacon. The test weight of PARK is only slightly below Larker, and better than Beacon.

### Disease Reaction of PARK

Disease data have been taken at selected locations in North Dakota where good differential readings could be obtained. These data are shown in Table 4.

**Table 4. Reaction of PARK and Larker to Prevalent Diseases in North Dakota in 1968-77.**

Characteristic	No. of Station Years	Larker	PARK
Leaf spot, 1-10*, **	3	7.1	3.4
Net blotch, 1-10**	4	2.5	1.3
Septoria, 1-10**	3	6.0	2.0
Spot blotch**	4	3.6	1.9
Loose smut	—	Susc.	Susc.
Covered smut	—	Susc.	Susc.

*Disease notes taken at selected locations where good differential readings could be obtained.*

\*Includes foliar diseases (spot blotch, net blotch, Septoria leaf blotch).

\*\*1 = no symptoms, 10 = severe symptoms.

PARK is considerably more resistant than Larker to the leaf spotting diseases, spot blotch, net blotch, and Septoria leaf blotch. One or more of these diseases can be a serious problem for barley producers, especially when conditions are favorable for high yields. Because of its high level of resistance, PARK is recommended especially for those areas where leaf spotting diseases may be a problem. PARK is similar to Larker in being resistant to stem rust, and susceptible to leaf rust and covered and loose smut.

### Malting Quality of PARK and GLENN

Small scale malting tests have been conducted on PARK and GLENN since 1968 and 1969, respectively. Table 5 presents a comparison of the malting

characteristics of these two new varieties with some of the currently acceptable malting barleys grown in North Dakota. The data were obtained from North Dakota variety plot trials conducted from 1973 to 1976.

A comparison of the kernel size or assortment of PARK and GLENN with Larker and Beacon shows that PARK contains the lowest percentage of plump kernels, while GLENN is intermediate between Beacon and Larker. In percentage of thin kernels, Larker and Beacon are almost equal, GLENN being slightly higher and PARK higher still.

GLENN shows an advantage in total protein content, being some 0.3 percentage points below Larker. PARK, however, is about 0.4 percentage points higher than Larker in total protein content. Both of the new varieties are higher in wort protein than Larker. This is a desirable trait as the brewing industry continues to use greater levels of low protein adjuncts (corn or rice). The additional wort protein is required to ensure that sufficient nitrogen is available for yeast metabolism during fermentation. Both of the new varieties show acceptable wort/total protein ratios, this being a measure of the variety's ability to solubilize protein during mashing.

The laboratory extract yield of both PARK and GLENN exceeds that of Larker, but falls short of that of Beacon. The fine-coarse grind extract difference for both new varieties is superior to that of Larker, GLENN only slightly so. The fine-coarse grind extract difference is a measure of the ease with which the kernel endosperm modifies during the malting process. Lower values indicate superior performance in this respect.

The amylolytic activity is a measure of the variety's ability to break down the endosperm to form fermentable sugars for yeast metabolism and alcohol production. The diastatic power and  $\alpha$ -amylase activity of both PARK and GLENN are higher than the corresponding activities of Larker. These higher activities are important because of the greater use of starchy adjuncts by the brewing industry.

Based on these data, PARK is superior to Larker in extract, wort nitrogen, and enzyme activity. GLENN is superior to Larker in total protein content, wort protein, extract, and enzyme activity.

The data presented here have been confirmed by

similar malting tests conducted at the National Barley and Malt Laboratory (USDA), Madison, WI. Plant Scale Malting and Brewing Tests.

## PARK

Carlot testing of PARK was conducted on grain produced by North Dakota farmer cooperators in 1975 and 1976.

For the 1975 crop, three brewers evaluated PARK malt. In these tests, PARK received three satisfactory ratings for malting characteristics. Its brewhouse performance was rated satisfactory by two collaborators and intermediate by one. PARK received three overall ratings of satisfactory.

Four brewers tested PARK from the 1976 crop. The variety received four satisfactory ratings for its malting characteristics, three satisfactory and one intermediate for brewhouse performance, and an overall rating of three satisfactory and one intermediate.

Based on these results, the Malting Barley Improvement Association, in November, 1977, classified PARK as an acceptable variety for malting.

## GLENN

Carlot testing of GLENN also was conducted on grain from the 1975 and 1976 crops.

Four collaborators tested GLENN from the 1975 crop. It received three satisfactory and one intermediate rating for malting characteristics, and two satisfactory and two intermediate ratings for brewhouse performance and overall varietal characteristics.

In the 1976 collaborative study, GLENN received two intermediate and one satisfactory rating for malting characteristics, three satisfactory ratings for malting characteristics, three satisfactory ratings for brewhouse performance, and three satisfactory overall ratings.

Since the Malting Barley Improvement Association requires two years of satisfactory performance before a variety is classified as a malting barley, GLENN has not yet been classified. A further year of plant scale tests will be performed on grain from the 1978 crop. Hopefully, GLENN will be classed as an acceptable variety for malting and brewing when tests are completed.

Table 5. Malting Quality of Larker, Beacon, Park and Glenn<sup>1/</sup>

	Kernel Assortment		Malt Recovery (%)	Total (%)	Protein Wort (%)	W/T	Extract		Diastatic Power (°L)	Alpha Amylase (DU)
	Plump (%)	Thin (%)					Fine (%)	F.C (%)		
Larker	68.7	7.4	91.0	15.5	4.60	29.8	74.2	3.1	169	39.9
Beacon	62.5	7.7	90.6	15.6	4.67	30.1	74.9	2.3	188	40.9
Park	59.0	10.6	90.4	15.9	5.05	31.8	74.5	2.4	187	47.0
Glenn	64.8	8.7	91.1	15.2	4.79	31.8	74.6	2.9	181	43.3

<sup>1/</sup>Averages of variety plot trials, 1973-1976. Grown at Carrington (dryland and irrigated), Dickinson, Fargo, Langdon, Minot and Williston, ND. Larker, 26 station years; Park, 27 station years; Glenn and Beacon, 28 station years.