

BEACON and NORDIC . . .

Barley Varieties for North Dakota

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The North Dakota Agricultural Experiment Station has named and released two barley varieties within the last three years. An announcement of the release of the new barley variety, Beacon (CI 15480), was made in January, 1973. Seed increase of Beacon barley will be made in all counties in North Dakota in 1973 under contract with the North Dakota Agricultural Experiment Station. No Beacon seed will be available for commercial seed production in 1973. A seed allocation of Beacon also will be made to the North Dakota seed trade and interested states in the region. Beacon has been approved as an acceptable malting barley for North Dakota.

Nordic (CI 15216) barley was named and released by the North Dakota Agricultural Experiment Station in January, 1971. Initial increase of Nordic was made under the same contract arrangements as planned for Beacon. Nordic is in commercial production in this area, and occupied 6.9 per cent of the 1972 barley acreage in North Dakota. The malting and brewing industry through the Malting Barley Improvement Association, Milwaukee, Wisconsin, has decided not to classify Nordic as acceptable for malting and brewing.

Hybridization, selection and development of Beacon and Nordic were done at North Dakota State University through cooperation of the Departments of Agronomy, Plant Pathology, and Cereal Chemistry and Technology. Also, branch stations in North Dakota, cooperating states in the region, the USDA National Barley and Malt Laboratory, Madison, Wisconsin, and industry laboratories under the auspices of the Malting Barley Improvement Association collaborated in the testing of these two barley varieties.

The history of the development, the agronomic traits and the disease performance of Beacon and Nordic will be discussed separately.

History of Beacon Barley

Beacon is a selection from the cross, Conquest x Dickson, made in the 1963 spring greenhouse at Fargo, North Dakota. The early generations of the cross were grown alternately at Fargo and in the winter increase nursery at Ciudad Obregon, Sonora, Mexico. The winter increase nursery was used three times, thus reducing the time to develop the variety by growing two crops within a year. Beacon resulted from an individual plant selection in the F₅ generation at Fargo. Performance trials were started in 1966 in North Dakota and regionally in 1968. Beacon was tested under the number N.D. B140.

Agronomic Characteristics of Beacon

Beacon is a six-rowed, rough-awned, spring barley with colorless aleurone and short rachilla hairs. Agronomic comparisons of Beacon with the present leading varieties, Larker and Dickson, as grown at several locations in North Dakota during 1968-72, are presented in Table 1. Data for Nordic barley also are included and will be discussed later.

The average grain yield of Beacon has been similar to Larker and lower than Dickson in North Dakota. Beacon has yielded as well as Dickson and better than Larker in tests conducted regionally. Beacon averages two to four days earlier in maturity, but is similar in plant height to Larker and Dickson. Straw strength of Beacon is one of its advantages, since it lodges less than any of the present important barley varieties grown in the area. Test weight of Beacon is slightly below that of the check varieties. Kernel plumpness of Beacon is slightly less than Larker, slightly greater than Conquest and Nordic, and considerably more than Dickson.

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Disease Reaction of Beacon

Disease data have been taken at selected locations in North Dakota where good differential readings could be obtained. These data are given in Table 2.

Beacon is similar to Dickson in resistance to spot blotch, and Septoria leaf blotch, but has a slightly higher level of resistance to net blotch. Beacon exceeds Larker in resistance to all prevalent leaf spots. Beacon, Dickson and Larker are all similar in their reaction to prevalent races of rusts, being resistant to stem rust and susceptible to leaf rust. Beacon is the only colorless aleuroned malting variety with resistance to loose smut.

History of Nordic Barley

Nordic resulted from a cross of Dickson 3x CI4738 2x Trail x UM570 made in the greenhouse in the fall of 1961. The early generations of the cross were grown at Fargo and in the winter increase nursery in Mexico. The final plant selection of Nordic was made in the F₆ generation in Mexico. Extensive agronomic, disease and quality tests were started in North Dakota in 1965 and on a regional basis in 1968. Nordic was tested under the number N.D. B139. Nordic was released in 1971 as a potential replacement for Dickson and has performed well in those areas where Dickson is grown. The primary advantages of Nordic over Dickson are an increased level of kernel plumpness and superior resistance to the prevalent foliar disease, Septoria leaf blotch.

Agronomic Characteristics of Nordic

Nordic is a spring barley with a six-rowed spike, rough awns, short rachilla hairs and colorless aleurone. The kernel characteristics of Nordic are

Table 1. Agronomic performance of Beacon and Nordic compared with Larker and Dickson grown at several locations in North Dakota in 1968-1972.

Characteristic	No. of station years	Larker	Dickson	Beacon	Nordic
Yield, bu/A	36	64.3	69.9	64.5	68.5
Days to heading after May 31	35	31.1	33.2	29.6	31.9
Date mature in August	11	4.8	5.7	2.3	5.6
Height, inches	37	33.3	33.1	33.3	34.3
Lodging, %	23	42	40	30	44
Test weight, lbs/bu	28	49.2	48.3	47.4	48.8

very difficult to distinguish from Dickson. Comparative performances for agronomic characteristics of Nordic with popularly grown varieties are given in Table 1 in addition to the data of Beacon. Grain yields of Nordic have been similar to Dickson but superior to Larker. Maturity of Nordic is between that of Larker and Dickson, while its lodging resistance is similar to Larker and Dickson. Test weight of Nordic is above Dickson and slightly below Larker. Nordic is slightly less plump than Larker and Beacon, similar to Conquest, and much plumper than Dickson.

Disease Reaction of Nordic

Comparative disease data on Nordic are given in Table 2. Like Dickson, Nordic has field resistance to the prevalent leaf spotting diseases, spot blotch and net blotch, but with a much higher level of resistance to Septoria leaf blotch. Nordic has the best resistance to Septoria leaf blotch of barley varieties grown in North Dakota and adjacent states. Nordic is superior to Larker in resistance to all of these foliar diseases. Nordic is similar to Dickson and Larker in being resistant to stem rust, but susceptible to loose smut and leaf rust.

Table 2. Reaction of Beacon and Nordic compared with Larker and Dickson for prevalent diseases in North Dakota in 1968-72.

Disease	No. of station years	Larker	Dickson	Beacon	Nordic
Leaf spot, 1-10 ¹ , ^a	5	5.4	3.1	3.2	2.3
Net blotch, 1-10 ²	3	3.7	2.5	1.5	2.2
Septoria leaf blotch, 1-10 ²	2	6.0	3.0	2.5	1.5
Leaf rust, %	3	23	38	29	18
Loose smut ³	-	S	S	R	S

^aIncludes foliar diseases (spot blotch, net blotch, Septoria leaf blotch).

²1 equals no symptoms, 10 equals severe symptoms.

³S equals susceptible, R equals resistant.

Malting Quality of Beacon and Nordic

Small scale malting tests have been conducted on Nordic and Beacon since 1966. Table 3 was prepared to provide a comparison of the malting quality of these two varieties with some of the current acceptable malting barleys grown in North Dakota. The data shown involve the variety plot trials for the years, 1969-71.

A comparison of the kernel size or assortment of Nordic and Beacon with Larker, Dickson and

Table 3. Malting quality of Nordic, Beacon, Larker, Dickson and Conquest.¹

Variety	Kernel Assortment %		Plumpness Score	Malt Rec. (%)	Protein (%)			Extract (%)		Diastatic Power °L	Alpha Amylase 20°D.U
	Plump	Thin			Total	Wort	W/T	Fine	F-C		
Larker	74.9	5.1	570	92.1	14.7	4.52	30.8	74.8	3.1	153	32.1
Dickson	51.3	10.1	541	92.3	13.9	4.52	32.6	74.6	3.2	152	34.0
Conquest	68.1	5.4	563	91.3	14.5	4.94	34.1	75.9	2.2	145	40.9
Nordic	67.4	7.1	560	91.0	14.2	4.83	34.2	75.1	2.1	161	39.9
Beacon	71.2	4.8	566	91.6	14.9	4.77	32.1	75.4	2.2	176	33.8

¹Average of 20 station-years grown at Fargo, Langdon, Minot, Carrington (irrigated and dryland), Williston (except 1971), and Dickinson. Variety plot trials, 1969-71.

Conquest shows that both of these new varieties are somewhat plumper than Dickson, about equal to Conquest, but not quite as plump as Larker. The plumpness score, which is a weighted average of the kernel size, shows about the same general comparison. Malt recovery for Larker and Dickson is somewhat better than Conquest, Nordic and Beacon.

Some advantages are noted in protein properties. Beacon tends to be higher in protein when compared to Nordic or Dickson and may offer some market problems. However, the higher wort protein of Conquest, Nordic and Beacon is a desirable property for the brewer. The additional yeast food (wort protein) assures adequate fermentation for brewing beers with high adjunct to malt ratios. All varieties show an acceptable wort to total (W/T) protein ratio. This value indicates per cent of total protein solubilized during mashing and is a measure of the malt's ability to hydrolyze protein.

The yield of laboratory extract from Nordic and Beacon is higher than Larker or Dickson but not as high as Conquest. The fine-coarse grind extract difference (F-C) is a measure of the degree of modification of the kernel endosperm during malting. The lower the value, the more desirable the property. The data show that Nordic and Beacon modify better than Larker or Dickson by a significant amount.

The amylolytic enzyme activity as measured by diastatic power and alpha-amylase activity is an indication of potential sugar production during the mashing step in brewing. All varieties are in an acceptable range with a slight advantage shown by both Nordic and Beacon.

From the results of these small scale malting tests, it can be concluded that Nordic and Beacon appeared to have acceptable malting quality. Similar tests performed by the National Barley and Malt Laboratory (USDA), Madison, Wisconsin, and

some industrial laboratories have confirmed these findings. Although these kinds of tests are fairly reliable indicators of malting and brewing potential, plant scale tests of carlot size must be performed to assure the industry that the new variety offers no economic or processing problems.

Plant Scale Tests

NORDIC. Carlot testing of Nordic was conducted on grain from three crop years, 1969-71. The malting and brewing evaluation of the 1969 crop consisted of one malting and two brewing tests. One brewer rated Nordic equal to the malt check; the other brewer rated it intermediate.

For the 1970 crop, six breweries evaluated malt. In these tests, Nordic received two satisfactory, three intermediate and one unsatisfactory rating. A third year of testing was recommended to establish a firmer base to make a final decision with respect to its acceptability for malting and brewing. In their comments, most of the brewers noted a lower brewhouse yield.

The final commercial test was on the 1971 crop. One brewer rated Nordic satisfactory in overall quality, while a second brewer rated the variety as intermediate. Based on three years of plant scale tests, the Malting Barley Improvement Association announced in December, 1972, that the Association will not classify Nordic as acceptable for malting and brewing. The final conclusion was that the collaborating maltsters and brewers preferred Larker and Dickson to Nordic.

BEACON. Two years of plant scale carlot tests (1970 and 1971) and a total of seven brewing evaluations showed that all seven of the brewing tests rated Beacon as satisfactory in overall quality. Since Beacon barley showed satisfactory results for two years in a row, the Malting Barley Improvement Association classified the new barley as an acceptable malting variety.