

HARBINE

OSU
Collection

A New Combine Barley

By

T. H. JOHNSTON

and

A. M. SCHLEHUBER



OKLAHOMA AGRICULTURAL EXPERIMENT STATION
in cooperation with
UNITED STATES DEPARTMENT OF AGRICULTURE



H A R B I N E: The name "Harbine" was derived from the words "Harlan" and "combine." The late Dr. H. V. Harlan, who had charge of barley breeding for the U. S. Department of Agriculture for 35 years, supervised the development of the composite cross from which Harbine later was selected.



OKLAHOMA AGRICULTURAL EXPERIMENT STATION
Oklahoma A. & M. College, Stillwater
W. L. Blizzard, Director Louis E. Hawkins, Vice Director
in cooperation with
Division of Cereal Crops and Diseases
Bureau of Plant Industry, Soils, and Agricultural Engineering
Agricultural Research Administration
UNITED STATES DEPARTMENT OF AGRICULTURE

CONTENTS

Origin and History	6
Plant and Seed Characteristics	7
Other Characteristics	7
Stiffness of Straw	7
Test Weight	9
Maturity	9
Yield	12
Disease Resistance	12
Winterhardiness	14

HARBINE

A New Combine Barley

By T. H. JOHNSTON and A. M. SCHLEHUBER*

A winter barley suitable for combine harvesting soon will be generally available to Oklahoma growers. The new variety, named Harbine, has a short, stiff straw which gives it outstanding resistance to lodging. Seed is now being released through the Oklahoma Crop Improvement Association.

Harbine was developed in the small-grain breeding program conducted cooperatively by the Oklahoma Agricultural Experiment Station and the United States Department of Agriculture.

Here are some of the important facts about this new combine-type winter barley, as shown by numerous tests in Oklahoma and other states in the winter barley area:

The two outstanding characteristics of Harbine are its relatively short, stiff straw and its high test weight. It is a six-rowed, rough awned, small-seeded variety, with short, erect heads.

Under Oklahoma conditions Harbine is a medium early, high yielding variety with winterhardiness about equal to Tenkow.

Harbine carries considerable resistance to leaf rust and some resistance to several other leaf diseases. It also appears to be highly resistant to five physiologic races, or "varieties," of loose smut.

* Respectively: Assistant Agronomist, Oklahoma Agricultural Experiment Station; and Agronomist, Division of Cereal Crops and Diseases and Oklahoma Agricultural Experiment Station.

Harbine, like Ward, reacts like a true winter variety; therefore, it should not be seeded in the spring for grain production.

Like all other commercial winter barleys tested at the Oklahoma Station, Harbine is susceptible to both chinchbugs and greenbugs.

Seed of the new variety has been increased on a contract basis by Oklahoma Foundation Seed Stocks, Inc., which distributed it to certified seed growers of the Oklahoma Crop Improvement Association for planting in the fall of 1950. About seven or eight thousand bushels of certified seed should be available for planting in the fall of 1951 if seasonal conditions are favorable.

Origin and History

Harbine winter barley (C. I. 7524)* originated as a selection from Composite Cross C. I. 5530. Seed of this cross was received by the Oklahoma Agricultural Experiment Station in September, 1930, from Dr. H. V. Harlan, now deceased, who at that time was Principal Agronomist in charge of barley investigations for the Division of Cereal Crops and Diseases. This composite cross included 13 different parent varieties, mostly of winter type. These varieties were: Winter Club, Everest, Golden Pheasant, Orel, Esaw, Nakano Wase, Trebi, Tennessee Winter 66, Tennessee Winter 52, Tennessee Beardless 6, Smooth Awn, Wisconsin Winter, and a variety identified only as "Row 3." The original plan for this composite cross was to make all possible crosses between varieties, but the number of individual crosses actually made is not known. It is believed that the original plan was not realized in full.** The final selection of the strain which has been named Harbine was made at Stillwater in 1935 by C. B. Cross, formerly Associate Agronomist, Oklahoma Agricultural Experiment Station, who was in charge of cereal crops research for the Oklahoma Station at that time.

Harbine has been grown in the variety yield test at Stillwater each year since 1941. It has been grown in numerous tests in Oklahoma under the designation Oklahoma No. 1004. In addition, it has been tested the past several years in uniform nurseries throughout the winter barley region of the United States as Composite Hybrid Selection, Okla. I-35-216, C. I. 7524.

* C. I. or "Cereal Investigation" number is the accession number of the Division of Cereal Crops and Diseases, U. S. Department of Agriculture.

** According to information received from Dr. G. A. Wiebe, Principal Agronomist in charge of barley investigations, Division of Cereal Crops and Diseases, U. S. Department of Agriculture.

Plant and Seed Characteristics

Harbine is a six-rowed variety with rough awns. It is similar in this respect to Tenkow and Ward, the other two varieties of winter barley presently recommended for growing in Oklahoma. The heads or spikes of Harbine tend to be slightly shorter than those of Tenkow and Ward, and are usually quite erect. This is especially true a few days prior to ripening, although occasional nodding heads usually are present. Harbine tillers or stools profusely. The grain threshes relatively free from awns or beards. The kernels are somewhat small, being similar to those of Ward.

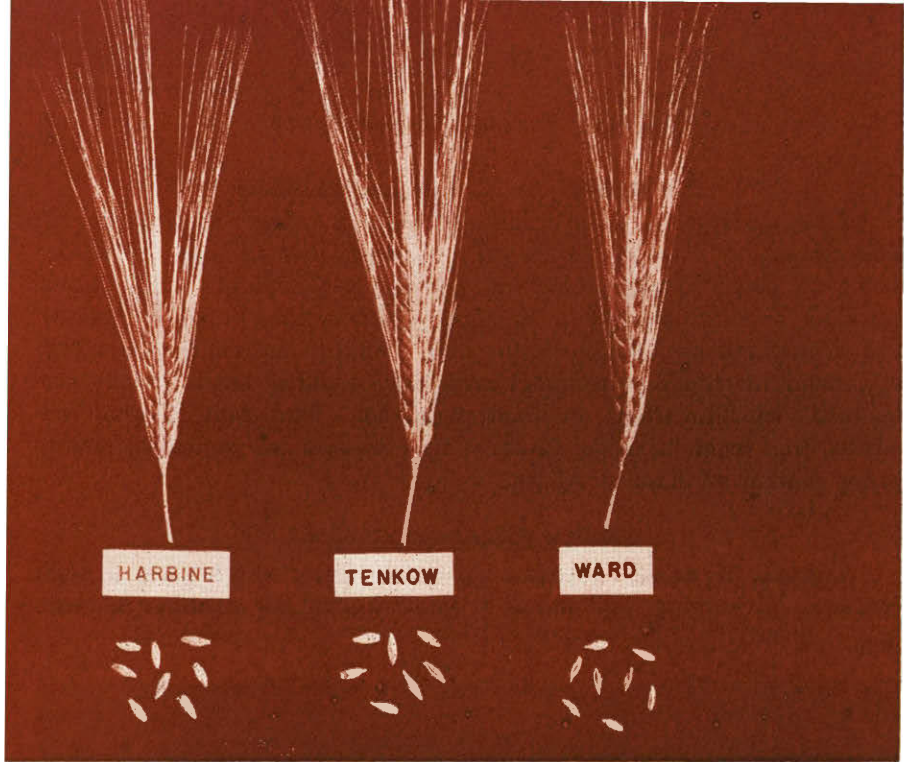
Other Characteristics

Stiffness of Straw.—Harbine has a stiff straw which gives it high resistance to lodging and makes it very suitable for combine harvesting.



Combining a Seed Increase Field of Harbine Barley

This picture, taken in the summer of 1930 at the Perkins farm, shows a combine in action in a seed increase field of breeder's seed of Harbine barley. Although harvest was delayed two weeks in 1949 because of wet weather and heavy wind and rain-storm, a similar field of Harbine was combined with little, if any, loss of grain from lodging or shattering. Breeder's seed is released to the Oklahoma Foundation Seed Stocks, Inc., for the production of foundation seed under contract.



Recommended Varieties of Winter Barley

Head and seed of the three recommended varieties of winter barley for Oklahoma. Harbine tends to have a somewhat shorter head than either Tenkow or Ward.

Table 1 shows relative amounts of lodging of Harbine and three other winter barleys at three locations in Oklahoma. The high percentages are due to the fact that lodging was recorded only when it was severe enough to permit comparison between varieties.

Table 2 shows average lodging for Harbine and certain other varieties grown in the uniform winter barley yield nurseries at a number of locations in the United States. As indicated in the table, the strength of straw of Kentucky 1 is similar to that of Ward whereas Wong is only slightly superior to Harbine in resistance to lodging. Although Wong is very outstanding for strength of straw, it is otherwise poorly adapted for growing in Oklahoma.

The data in Tables 1 and 2 show that Harbine is much more re-

sistant to lodging, and therefore more suitable for combine harvesting, than are Ward, Tenkow, and Michigan Winter.

The lodging resistance of Harbine may be partly due to its shorter straw. As shown in Table 3, this new variety has averaged about one inch shorter than Ward and approximately two inches shorter than Tenkow and Michigan Winter in Oklahoma tests.

Test Weight.—Harbine has a relatively high test weight when compared with Ward, Tenkow, and Michigan Winter, three winter barleys grown commercially in Oklahoma (see Table 3).

Maturity.—Under Oklahoma conditions Harbine is a medium early variety. As shown in Table 3, it has headed one day earlier than



Heads, or Spikes, of Harbine Barley

Erectness of heads of Harbine barley is characteristic of this variety, especially a few days prior to ripening.

LODGING: Oklahoma Tests

Table 1.—Lodging* of Harbine and of Three Commercially Important Winter Barleys at Three Locations in Oklahoma.
(Percent of plants lodged)

Variety	Cherokee		Woodward 1947	Stillwater 1946	4-Test Average
	1947	1949			
Harbine	58	55	10	6	32
Ward	91	74	15	8	47
Tenkow	88	73	20	24	51
Michigan Winter	65	68	15	28	44

* Lodging data were taken only in years when lodging was severe enough to permit comparison between varieties.

LODGING: Regional Tests

Table 2.—Lodging of Harbine and Other Winter Barley Varieties Grown at Several Locations in the Winter Barley Region of the United States.*

(Percent of plants lodged)

Variety	C. I. No.	1947-1948**	1947-1948†	1949**	1949†
		Weighted av. 28 test yrs.	Weighted av. 9 test yrs.	14-Sta. av.	7-Sta. av.
Harbine	7524	16.2	-----	-----	16.0
Tenkow	646	-----	50.0	-----	-----
Ward	6007	-----	-----	42.4	-----
Kentucky 1	6050	46.2	36.4	42.9	41.3
Wong	6728	15.6	16.9	9.9	13.6

* With the permission of those concerned, data presented in this table were taken from the mimeographed annual reports on the 1948 and 1949 Uniform Winter Barley Nurseries compiled by Dr. G. A. Wiebe, Principal Agronomist, Division of Cereal Crops and Diseases, U. S. Department of Agriculture. These uniform nurseries were grown at a number of experiment stations in the winter barley region in cooperation with the Division of Cereal Crops and Diseases, U. S. Department of Agriculture.

** Data from Uniform Winter Barley Yield Nursery (Hardy varieties).

† Data from Uniform Winter Barley Yield Nursery (Semi-hardy varieties).

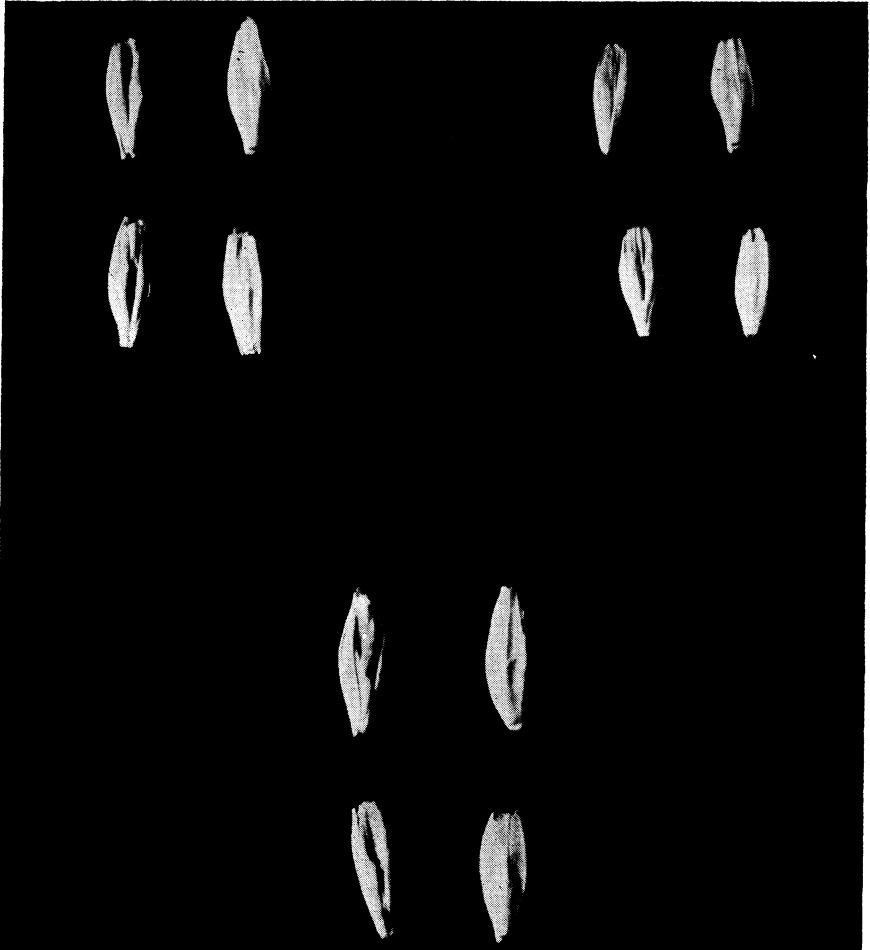
TEST WEIGHT, HEIGHT, and MATURITY

Table 3.—Average Weight Per Bushel, Height, and date headed of Four Varieties of Winter Barley Grown at Four Locations in Oklahoma, 1946-1949.

Variety	Weight per bu.	Height	Date Headed
	Average 13 test yrs. Lbs.	Average 10 test yrs. In.	4-Yr. Av. (Stillwater)
Harbine	44.8	26.8	April 27
Ward	44.2	27.6	April 28
Tenkow	43.9	28.5	May 2
Michigan Winter	43.7	29.2	April 30

Ward, three days earlier than Michigan Winter and five days earlier than Tenkow, as an average of four years at Stillwater.

In years when Harbine has headed from spring seeding, the heading occurred several days later than in Tenkow sown at the same time. Because, from spring seeding, it failed to head in some years and headed extremely late in others (at Stillwater), Harbine can be classed as a true



Seeds of Three Barley Varieties Recommended for Oklahoma

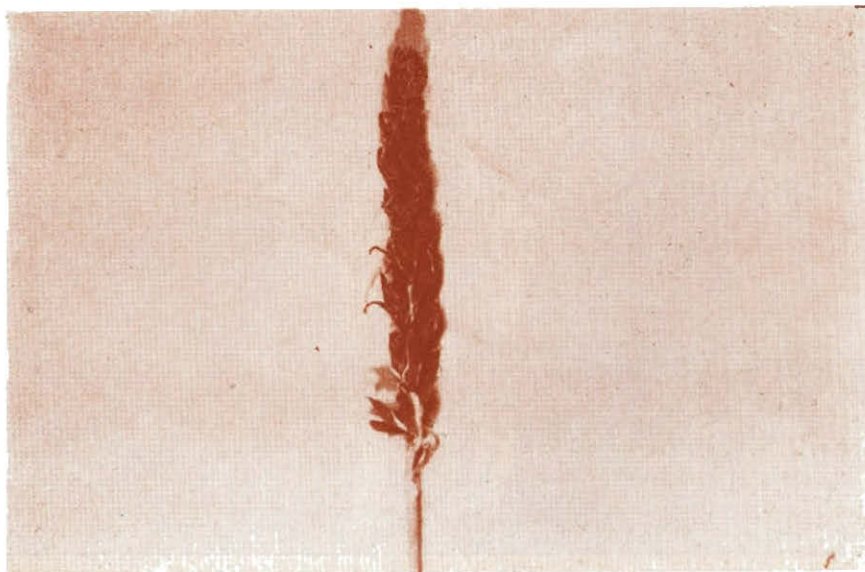
Seeds of Harbine (upper left), Ward (upper right), and Tenkow, the three varieties of winter barley recommended for growing in Oklahoma. Upper kernels of each variety are from lateral florets, while the lower kernels are from central florets. Note relative seed size of the three varieties.

winter type similar to Ward. Both Harbine and Ward head several days before Tenkow when all three varieties are fall sown.

Yield.—Yields of Harbine in tests to date have been about equal to those of varieties now commonly grown. The major advantage of the new variety is its suitability for combine harvesting.

Annual yields of Harbine over a 10-year period in the variety test at Stillwater are shown in Table 4. The yields of Ward, Tenkow, and Michigan Winter are also shown. The average yields of these same varieties grown at four locations in Oklahoma through 1950 are shown in Table 5. As an average of 20 test years, Harbine has yielded 40.8 bushels per acre as compared to 41.7 for Tenkow, 39.1 for Ward, and 37.0 for Michigan Winter. The slightly higher yield of Tenkow is somewhat offset by the smaller proportion of beards or awns which remain attached to the Harbine kernels after threshing or combining.

Disease Resistance.—Harbine carries considerable resistance to leaf rust and some resistance to several other leaf diseases. Preliminary studies at Stillwater indicate that Harbine is highly resistant to five



Smutted Head of a Winter Barley

Picture shows the smutted head of a 6-rowed awned variety of winter barley. Note that the masses of loose smut spores (*Ustilago nuda*) have replaced the barley kernels. Harbine has shown resistance to five races of this disease, according to preliminary tests.

YIELD: Stillwater

Table 4.—Annual and Average Grain Yields of Harbine and Three Commercially Important Varieties Grown in the Winter Barley Variety Test at Stillwater, Oklahoma, 1941-1950.*

Variety	(Bushels per acre)										10-yr. av.
	1941	1942	1943	1944	Year		1947	1948	1949	1950	
Harbine	31.3	14.0	22.9	54.8	46.7	28.6	39.4	22.6	40.0	38.8	33.9
Ward	30.9	23.9	18.5	54.6	39.7	30.3	41.8	23.6	37.5	40.5	34.1
Tenkow	34.0	13.8	23.7	61.6	47.3	23.3	37.9	23.0	30.9	38.8	33.4
Michigan Winter	20.3	22.5	20.0	38.4	44.2	28.2	45.7	24.6	34.8	35.8	31.5

* The 1947 variety test was grown at the Perkins Agronomy Farm, 9 miles south of Stillwater.

YIELD: Oklahoma Tests

Table 5.—Average Grain Yields of Harbine and of Three Commercially Important Winter Barley Varieties at Four Locations in Oklahoma, 1941-1950.

(Bushels per acre)

Variety	C. I. No.	Stillwater 10-yr. av.	Woodward 3-yr. av.	Cherokee 4-yr. av.	Goodwell 3-yr. av.	Weighted Av. 20 test yrs.
Harbine	7524	33.9	36.7	58.8	43.8	40.79
Tenkow	646	33.4	41.5	58.0	47.9	41.71
Ward	6007	34.1	34.3	53.9	41.0	39.13
Michigan Winter	2036	31.5	30.7	53.6	39.7	37.03

physiologic races of "nuda" loose smut (*Ustilago nuda*). Hot water treatment of the seed is required to control this smut, since the disease organism is carried inside the seed. Mercuric compounds which will control many of the cereal smuts, including covered smut of barley (*Ustilago hordei*) and "nigra" loose smut of barley (*Ustilago nigra*), will not control nuda loose smut of barley (*U. nuda*).

Winterhardiness.—Harbine is about equal in winterhardiness to Tenkow, which is grown widely in Oklahoma. Neither Harbine nor Tenkow is as winterhardy as Ward, and therefore may suffer considerable leaf injury from low temperatures. However, both Harbine and Tenkow have shown remarkable ability to recover from this type of injury.

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