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BARLEY PRODUCTION IN TEXAS

I. M. ATKINS and P. B. DUNKLE

Division of Agronomy

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AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS
T. O. WALTON, President

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Barley is at present grown on a relatively small acreage in Texas as compared with other small grains and corn. Erratic yields, poorly adapted varieties and failure to recognize the full value of the crop as a feed and pasture crop partially explain the lack of popularity of the crop.

This bulletin points out some of the advantages of barley as a crop and presents data on two new barley varieties adapted to Texas conditions which are now available.

Two rather extensive areas of the state are suited to barley production. Fall seeding is recommended in the central and north central part of the state using the new smooth awned variety, Texan, in the central part and Wintex in the north central part of this area. Spring seeding is less productive and is not recommended unless winter killing occurs. Throughout this area barley produces yields of grain equal to that of corn or grain sorghum and in addition provides a winter cover for the land to prevent soil erosion and it produces abundant pasturage for livestock. On the high plains area barley may be either fall or spring seeded. Fall seeding of Wintex or Tennessee winter types may be winter killed some seasons, but, if they survive, are more productive than spring seeded barley. In seasons of ample spring rainfall barley is a desirable spring sown catch crop.

Barley fits into the rotation in a place similar to oats and wheat and is handled with equipment used for other small grains. As a feed grain barley is approximately equal to corn and grain sorghum, but should be ground for all classes of livestock.

Barley is less subject to attack by rust than other small grains due to its early maturity. The common diseases, smut and stripe, may be controlled by seed treatment.

CONTENTS

BARLEY PRODUCTION IN TEXAS

I. M. Atkins, Associate Agronomist, U.S.D.A., and
P. B. Dunkle, Superintendent, Substation No. 6, Denton

(Division of Agronomy, Texas Agricultural Experiment Station, and Bureau of Plant Industry, U. S. Department of Agriculture cooperating)

Although barley is at present one of the minor farm crops of Texas in point of acreage devoted to it, its importance as a grain and pasture crop should increase as new varieties adapted to Texas conditions become generally available. Two superior new varieties, Wintex and Texan, have recently been developed at Texas Substation No. 6, Denton, Texas, and are now available to Texas farmers. These new varieties are described in this bulletin, and further breeding work is in progress.

Barley ranks well below oats, wheat, corn, and grain sorghum in acreage and farm value in Texas. The maximum barley acreage planted in the state was 225,000 acres in 1932. During the 10-year period 1929 to 1938 inclusive, an average of 146,000 acres of barley was planted, producing an average annual production of 2,445,000 bushels. The acreage and production fluctuate widely, being influenced by spring moisture conditions in west Texas and by winterkilling in north central Texas. The average yield per acre, 16.7 bushels, is low, although it is equal to that of corn.

In figure 1 the distribution of the barley acreage in Texas for the 1939 crop as given in the 1940 census, is shown, and the locations of the State and Federal experiment stations in Texas cooperating in the barley varietal tests are indicated on the map.

ADAPTATION OF BARLEY

Barley is grown under a wide range of climatic conditions and on many soil types in the United States. It is not adapted to the sandy soils, nor to the areas of high rainfall in the state. It matures more quickly than the other small grains. It thrives best in a cool climate, hence is usually fall seeded in Texas.

There are two distinct, major barley growing areas in Texas, as shown in Figure 1. In central Texas, the crop is usually fall sown. It matures from May 15 to 30 and thus escapes high temperatures and in most seasons injury from rust. The crop winterkills occasionally, three complete losses being recorded since 1912, namely in 1916, 1930, and 1935. In 1930 and 1935 the fall sown crop was killed but at such an early date that replanting was possible. With the new varieties now available, winter planting with fair success is possible if the fall sown crop is killed. The barley varieties, which are now available, are not recommended for south

Texas. Recent breeding work at College Station gives promise of producing strains adapted to that section.

The second barley producing area in the state is the high plains area of the Texas Panhandle. (Figure 1.) In this area, barley is grown from both fall and spring seeding. Fall seeded barley is more productive than spring sown barley but is often injured by low temperatures. Fall seeded barley under irrigation has given good yields in recent years in the southern part of this region. Considerable acreages of spring seeded barley are grown in seasons when spring moisture conditions are favorable.

In order to determine the adaptation of barley for the various sections of the state, it seems desirable to compare its relative productiveness with corn and grain sorghum. All are fattening feeds of approximately equal feeding value. In table 1 the comparative production of several crops in bushels and pounds per acre, and in productive energy per acre are given. The production in pounds per acre was converted to productive energy per acre because it is on this basis that the final value to the

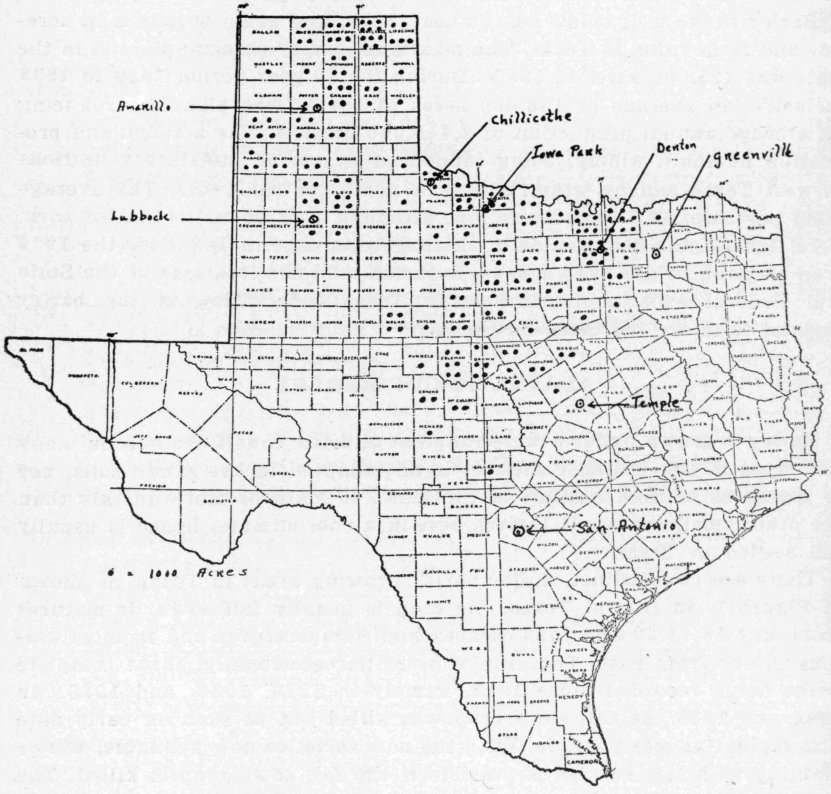

Figure 1. Distribution of barley acreage in Texas, 1939 crop, 1940 Census.

Table 1. Comparative Production of Five Farm Crops in Bushels, Pounds, and Productive Energy per Acre at Experiment Stations in Texas.

	Barley	Corn	Grain Sorghum	Oats	Wheat
Productive energy of each feed—therms per 100 lbs.	74.4	84.8	84.8	70.5	78.8
Texas Substation No. 6, Denton, Texas					
Average yield—16 years—1913-1939—bushels	29.5	27.5	29.5	68.1	24.5
Average yield—16 years—1913-1939—pounds	1416	1540	1662	2179	1470
Productive energy per acre—therms	1053.5	1305.9	1409.4	1536.2	1158.4
Average yield—4 years—1936-39—in which Wintex has been included—bushels	51.4	30.7	40.5	81.0	30.0
Average yield—4 years—1936-39—in which Wintex has been included—pounds	2467	1719	2268	2590	1800
Productive energy per acre—therms	1835.4	1457.7	1923.3	1825.9	1418.4
Texas Substation No. 5, Temple, Texas					
Average yield—6 years—1929-39—bushels	43.0	35.0	24.4	58.4	18.7
Average yield—6 years—1929-39—pounds	2064	1960	1366	1869	1122
Productive energy per acre—therms	1535.6	1662.1	1158.4	1317.7	884.1
U. S. Cotton Field Station, Greenville, Texas					
Average yield—2 years—1938-39—bushels	30.7	21.4	36.6	48.9	19.3
Average yield—2 years—1938-39—pounds	1474	1198	2048	1565	1158
Productive energy per acre—therms	1096.6	1015.9	1736.6	1103.3	912.5
Texas Substation No. 16, Iowa Park, Texas					
Average yield—6 years—1932-39—bushels	40.2	8.6	27.2	61.8	25.7
Average yield—6 years—1932-39—pounds	1927	484	1519	1978	1543
Productive energy per acre—therms	1433.7	410.4	1288.1	1394.4	1215.9
Texas Substation No. 12, Chillicothe, Texas					
Average yield—2 years—1938-39—bushels	36.3	14.3	24.1	----------	24.9
Average yield—2 years—1938-39—pounds	1742	800	1350	----------	1494
Productive energy per acre—therms	1296.1	678.4	1144.8	----------	1177.3

grower must be determined. The productive energy was computed by multiplying the pounds per acre by the value of therms of productive energy for each feed as given in Texas Bulletin 461, "The Composition and Utilization of Texas feeding stuffs."

At Denton, barley, corn and grain sorghum have produced approximately the same number of pounds per acre during 16 years of comparison in the period 1913 to 1939 inclusive. During the past four years Wintex barley has produced yields much superior to those of corn or grain sorghum. At Temple, barley is superior to either corn or grain sorghum. At Greenville barley is about equal to corn but both are inferior to grain sorghum for grain production. From these figures it would seem that barley is about equal to corn for grain production in central Texas and in addition provides abundant pasture during the winter months.

In the rolling plains area of north central Texas, barley has produced from two to five times as much grain as corn. Barley has also been superior to grain sorghum at both Iowa Park, under irrigation, and at Chillicothe. Spring sown barley in this area has given lower yields than fall sown barley.

USES OF THE BARLEY CROP

Practically all the barley grown in Texas is used as feed for livestock. No recent feeding trials of barley have been made by the Texas Experiment Station but frequent analysis of barley grown in the state show that it is nearly equal to corn in feeding value. It is higher in protein, ash, and crude fibre; but lower in nitrogen free extract and productive energy per 100 pounds of feed. The analysis of barley and several other grains as given in Texas Bulletin Number 461, "The Composition and Utilization of Texas Feeding Stuffs," are given in table 2.

Table 2. Analysis of Some Texas Grown Feeds

Crop	Number of tests	Per cent protein	Ether extract	Crude fibre	Nitrogen-free extract	Water	Ash	Digestible protein	Productive energy per 100 lbs.
Corn	105	10.4	4.4	2.3	72.5	9.1	1.3	6.4	84.8
Barley	336	12.0	2.1	6.3	67.5	9.3	2.8	9.6	74.4
Milo	652	11.1	2.9	2.5	70.9	10.7	1.9	8.1	84.8
Red Oats	469	11.4	4.9	12.8	58.6	8.6	3.7	8.9	70.5
Wheat	14	14.0	1.7	3.0	69.4	10.0	1.9	11.3	78.8

From the above analysis, it will be seen that barley is a good substitute for corn or grain sorghum in the fattening ration. Barley should be ground for all classes of livestock, except sheep.

Due to the relatively mild winter weather, small grains are a valuable source of winter pasture in Texas. Barley is especially valuable as an

early fall and winter pasture crop. As compared with oats and wheat, it grows off more rapidly, producing quicker pasture and higher tonnage during the fall months. Late pasturing in the spring will injure barley more than oats or wheat because of its early maturity. Barley should not be pastured later than February 15 in central Texas. Grazing of barley during the fall months is desirable to keep down top growth and lessen the danger of winterkilling. Data on the tonnage of green forage produced by the small grains during the fall and winter months was reported in Texas Experiment Station Bulletin Number 539, "Small grains and rye grass for winter pasture."

Barley is an excellent crop for winter cover to prevent soil erosion during the period of heavy rainfall. Loss of water and soil is much less on land planted to small grains during the winter months, than on unprotected land. In west Texas it also may aid in reducing soil blowing.

Barley may be used for hay or green manure crops, and in other sections is used extensively in the brewing industry. At present very little barley grown in this state is used for malting.

CULTURE OF BARLEY

The cultural operations for barley are similar to those required for other small grains. The best yields are obtained when the crop is grown on fertile, well drained soil, with good preparation of the seedbed and proper care of the crop. One reason for the low yield of barley in the state is that in the spring sown barley section the corp is often sown on abandoned wheat land which is deficient in moisture. Although barley is probably as good as any catch crop, except grain sorghum, high yields cannot be expected from such methods and care.

Place in the Rotation

In central Texas, barley may follow almost any crop but is most often planted following cotton or corn. Corn matures sufficiently early to allow good preparation of the seedbed for fall seeding of barley. Cotton land provides a desirable seedbed for small grains with a minimum amount of preparation. It is usually not desirable to plant barley following other small grains because volunteer plants of the previous crop cause mixtures of seed which are difficult to separate.

In west Texas, barley can be sown following other grains more easily than in central Texas because it is easier to kill all volunteer grain. If volunteer grain does not germinate due to dry weather then barley should not be planted on grain land. If the barley is to follow grain sorghum, it probably should be spring planted. Barley may also be planted on abandoned wheat land, if spring rainfall and subsoil moisture are favorable.

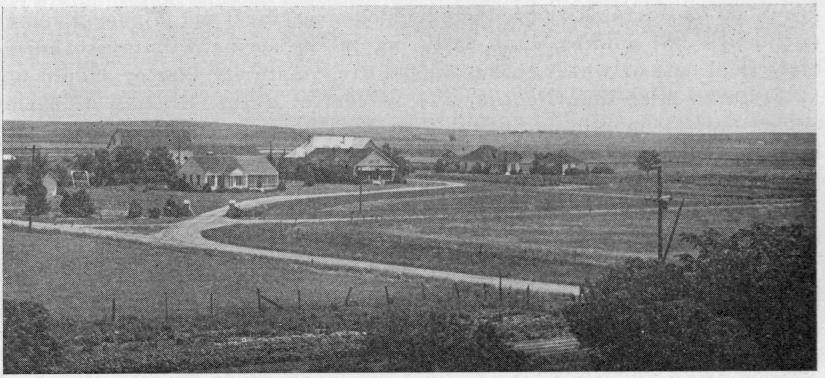

Figure 2. Buildings and grounds at Texas Substation No. 6, Denton, Texas, where Wintex and Texan, new barleys for Texas conditions have been developed.

Figure 3 shows barley being planted on cotton stalk land in the fall of the year in central Texas after the land has been disked or "scratched" with a field cultivator.

Figure 3. Planting barley on cotton stalk land.

Seedbed Preparation

In central Texas the seedbed for barley is often prepared simply by disking or scratching the ground with a field cultivator or by harrowing to level the ground following a crop of cotton. Since cotton is usually kept free of weeds, this makes an excellent seedbed. Figure 4 shows a seedbed ready for planting following a crop of cotton.

Figure 4. Seedbed for barley in cotton stalks.

Corn or small grain land that is to be planted to barley in the fall should be plowed as soon after harvest as possible and kept free of weeds until planting time. A firm, level seedbed is desirable.

In West Texas, seedbeds for spring sown barley should be left rough during the winter months to prevent soil blowing. A light cultivation with a one-way plow will then prepare the seedbed in the spring. If the previous crop is small grain or fallow, the ground may well be listed and relisted during the summer in preparation for the fall sown crop. If the ground has been plowed, a rod weeder or duck-foot cultivator are good implements to control weeds during the summer.

Seeding of barley should be done with a drill. This will insure a uniform rate of seeding at a uniform depth.

Rate and Date of Seeding

In central Texas 6 to 8 pecks per acre should be seeded and the crop may be planted from September 15 to November 15 with October 15 as

the most desirable date. If the crop is to be grazed, early seeding is satisfactory but if no grazing is practiced, then delayed seeding is desirable. If the crop is not planted by November 15 it usually is desirable to delay planting until January 15. Barley should not be planted after February 15.

In west Texas, fall seedings should be made from September 15 to October 15 at the rate of 4 to 6 pecks per acre. Spring seedings should be made from February 15 to March 15.

Harvesting and Threshing

The combine harvester-thresher is used almost exclusively for harvesting small grains in west Texas. In central Texas, until recently, the binder was the common method of harvesting. In recent years the small tractor power take-off type combines have come to be used extensively. Allowing the crop to stand for the combine is somewhat more hazardous in this section but with proper care and selection of varieties, it may be done. Although the windrow attachments have not been used extensively, it is believed they could be used to advantage in this section in certain seasons.

When cut with the combine, care should be exercised to see that the grain is fully ripe as barley grain of high moisture content heats quickly in the bin. If harvested with the binder the crop can be cut relatively green as barley matures readily in the shock. Rough awn barleys for feed purposes should be threshed closely enough to remove most of the awns as the rough awns may cause injury to the mouths of livestock.

VARIETIES

All varieties of commercial importance in Texas are of the six-row type in which all three spikelets at each node of the rachis in the head are fertile. This produces a head of six rows of grain, three on each side of the rachis or central stem. A small amount of hooded, commonly called beardless, barley is grown but these varieties are less productive than the bearded varieties. All adapted varieties, except the new Texan barley, have rough awns.

The commercial varieties described herein are divided into three types based on their reaction to fall and spring seeding. These are: true winter barleys; intermediate winter barleys; and true spring barleys. The true winter type varieties are suited only to fall seeding. They are more hardy than the other types and from fall seeding produce narrow leaved, prostrate growing plants similar to winter wheat. They do not head normally if spring planted. The intermediate winter type varieties differ from the true winter types in being less winter hardy, more upright in growth habit, and in being adapted to either fall or spring seeding, although they produce much better from fall seeding. The true spring type barleys are much less winter hardy than either of the other types and are suited only to spring seeding.

True Winter Type Barley Varieties

Tennessee Winter as a group name includes many strains of barley which are grown in the winter barley area of the United States. In Texas, winter barley has been grown under the names of **Tennessee Winter** and **Texas Winter** for many years. The strains cannot be distinguished from one another. To the north of Texas and to some extent in the Texas Panhandle, similar strains are grown under the names of **Wisconsin Winter, Michigan Winter,** and **Reno.** The last two strains are recommended as superior varieties in Oklahoma and southern Kansas and appear well adapted to west Texas. They are slightly more winter hardy than the Texas grown Tennessee Winter.

All of the strains of Tennessee Winter are typically true winter type barleys producing dark colored, narrow leaves which lie flat against the ground during the winter months. The plants tiller profusely producing relatively short, weak, straw which lodges rather easily. The heads are six-rowed, rather short, nodding, and when ripe are easily broken off in handling. The awns are long, barbed, and rather difficult to break from the grain in threshing. Under Texas conditions the grain is usually small and low in test weight. Although grown extensively in the past, these strains are now rapidly being replaced by the new varieties Wintex and Texan.

Missouri Early Beardless: This is a hooded (beardless) variety distributed by the Missouri Experiment Station. It has been brought into the state and tried rather extensively. It is equal or superior to Tennessee Winter in hardiness. One of its most desirable characteristics is its erect, leafy winter growth which provides abundant winter pasture. The leaves are broader and lighter green in color than Tennessee Winter. The heads are small, short, and the grain is very low in test weight under Texas conditions. In comparative tests it has yielded much less than the better awned varieties and the grain shatters easily as soon as ripe. Unless the grower intends to use the crop for pasture alone, the variety is not recommended.

Tennessee Beardless No. 5 and No. 6: These are hooded varieties distributed by the Tennessee Experiment Station. They are very late in maturity, very susceptible to smut, and produce very low yields under Texas conditions. They are not recommended.

Intermediate Winter Type Varieties

These varieties are of local origin in the vicinity of Denton, Texas, and represent a type of barley which has been grown for many years in north central Texas. The origin is obscure. They are called intermediate winter types because they are almost as hardy as true winter varieties and yet

will head from spring seeding. Due to the type of winter killing which ordinarily occurs, they usually survive if any barley does.

Wintex: This variety originated as a pure line selection from a local field of barley near the Denton Substation. The selection was made in 1931 by I. M. Atkins, Associate Agronomist in charge of the small grain breeding at Denton. The variety has been tested in field and nursery plats since 1934 and was distributed to farmers in 1939. Compared to Tennessee Winter, Wintex is more erect in winter growth, has wider leaves of lighter green color, the plants are slightly taller with stronger straw, the heads are larger and remain erect longer after they mature; the grain is larger, resulting in superior test weight. The variety is slightly later in maturity than Tennessee Winter but slightly earlier than other strains of similar type. As compared with the original strain from which it was selected, Wintex is slightly earlier from fall seeding and about 4 days earlier from spring seeding. Wintex has been very outstanding in yield trails at all the Substations except Temple and is now recommended for all of north central Texas. In figure 5 Wintex and Texan are shown in the field plat trials at Denton, Texas, in 1938.

Figure 5. Texan barley (left) and Wintex barley (right) in the field plat variety test at Denton, Texas, 1938.

Finley: This variety was distributed for a few years before Wintex was available, but has now been discontinued in favor of Wintex. It is similar to Wintex in most respects but is about two days later in maturity and slightly shorter in stature. Other local strains which have not been certified are known locally as Bailey, Bishop, and Smith barleys.

Texan: This is a new smooth awn variety developed at the Denton Substation. The selection was made in 1933 by I. M. Atkins. The exact parentage is unknown as it was selected from a bulk hybrid made up of several crosses which were made by Dr. H. V. Harlan, Principal Agronomist in charge of Barley Investigations, United States Department of Agriculture. The variety has produced good yields at most of the Substations but is especially well adapted in central Texas and will be distributed by the Temple Substation. The variety is similar to Wintex in most respects although the leaves are somewhat more narrow and darker green in color. It is slightly earlier in maturity. The awns are entirely free of the rough barbs which make barley so disagreeable to handle and may cause injury to the mouths of live stock. The variety is somewhat weaker strawed than Wintex and may lodge on fertile soil.

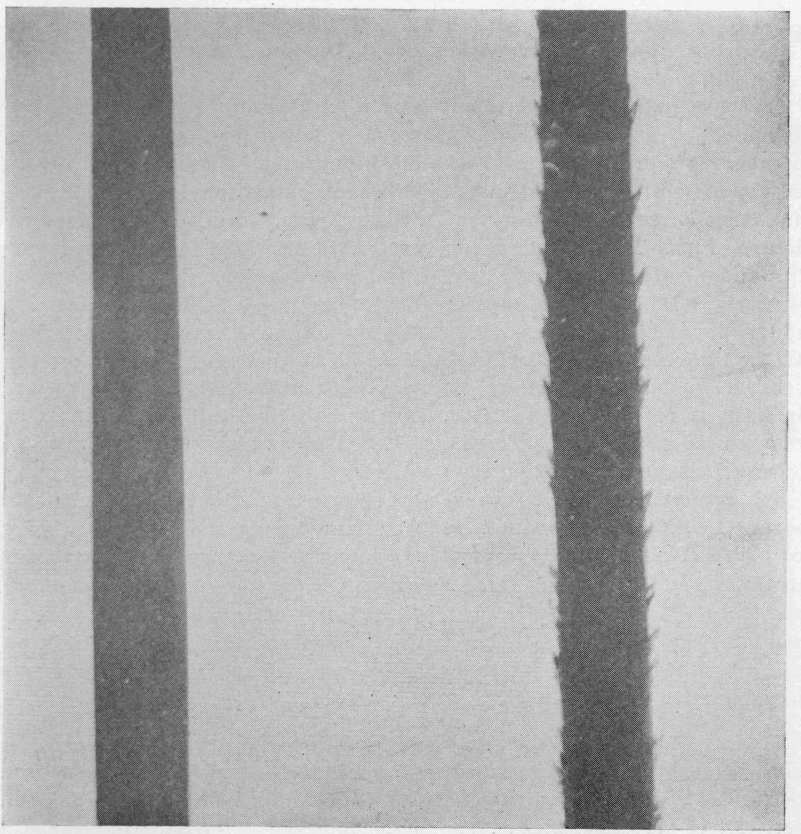

Figure 6. Awns of Texan (left) and a rough awn variety of barley (right) as seen through a microscope.

It is resistant to mildew. In figure 6 the awns of Texan in comparison with a rough awned variety are shown as they appear through the microscope.

True Spring Type Varieties

The spring type barleys grown in west Texas are at present a mixture of Stavropol, Coast, Trebi, and others brought in from adjoining states. Experimental work has only recently been undertaken in the west Texas area. Preliminary tests indicate Vaughn, Coast, and Stavropol are the most productive from spring seeding. Flynn barley has given good results in western Kansas and should give good results in west Texas.

EXPERIMENTAL RESULTS

Texas Substation No. 6, Denton, Texas

The most extensive experimental tests with barley in Texas have been conducted at Substation No. 6, located 5 miles west of Denton in the northern part of the central Texas blackland area. This is a well diversified farming area, cotton, oats, and wheat being the major cash crops with large acreages also devoted to barley, corn, grain sorghum, feed and pasture crops. The 28-year mean precipitation is 32.6 inches, the months of highest rainfall being April, May, and October. Temperatures are relatively mild although at times both oats and barley are killed by sudden low temperatures. The 28-year annual mean temperature is 64.7F.; the record minimum is —3 F. Fall sown barley yields more than spring sown barley as shown by the comparative yields of Wintex over the six-year period 1934 to 1940. During this time fall sown Wintex has averaged 55.4 bushes per acre and when spring sown it has averaged 43.8 bushels per acre.

Experimental trials of barley were started at the Denton Substation soon after its establishment in 1912. Data during the early years were not continuous and for the most part consisted of preliminary trials of introduced varieties and farm selections. For the present study only data from 1930 to 1940 are presented. Yields of strains previous to that time may be obtained at the station. Data are divided into fall and spring seeded barley and into field plat varietal trials and experimental nursery trials.

Yields of barley in field plat trials, fall seeded, Denton, Texas: Field plat tests of varieties consist of replicated 1/44-acre field plats. Winter killing destroyed the crop in 1930-31 so no data are available for that year. Three varieties, Finley, Tennessee Winter C. I. 6125, and Tennessee Winter C. I. 3545 have been grown continuously during the period. Other varieties are compared with these standards on a percentage basis for

comparable years. The most outstanding variety tested in recent years is the new variety Wintex, distributed by the station in 1939 as shown in Table 3. This variety has averaged 50.0 bushels per acre for the 5-year period 1936-1940, inclusive, or 131.9 per cent of the standard

Figure 7. Barley variety test in drill plats at Texas Substation No. 6, Denton, Texas, 1940.

varieties. The new smooth awn variety, Texan, has averaged 44.4 bushels per acre or 115.6 per cent of the standard varieties for the past three-year period.

Figure 7 shows barley varieties under comparison in the field plat variety test in 1940.

Figure 8. Experimental barley nursery at Texas Substation No. 6, Denton, Texas, where large numbers of new varieties and strains are tested in comparison with standard sorts.

Table 3. Yields of Barley Varieties Grown in Replicated 1-/44-Acre Field Plats From Fall Seeding, Denton, Texas 1932 to 1940, Inclusive

Number		Variety or strain	Yield per acre, bushels									Average	Percentage of standard varieties
C. I.	T. S.		1932	1933	1934	1935	1936	1937	1938	1939	1940		
6125	15825	Tennessee Winter*	31.3	24.9	52.7	28.2	33.8	49.8	41.2	34.9	32.4	36.6	101.9
3545	15826	Tennessee Winter*	33.5	20.6	43.9	26.1	27.3	44.7	40.8	32.4	33.9	33.7	93.9
5901	12576	Finley*	21.1	30.0	53.3	35.6	21.7	45.5	41.9	43.8	44.6	37.5	104.5
2159	15839	Wisconsin Winter	29.5	24.7	43.8	23.5	30.5	44.5				32.8	94.5
6126	18561	Tennessee Winter		22.2	48.5	27.4	33.3	44.0				35.1	97.8
6128	23259	Tennessee Winter, Winkelman				40.0	23.8	49.0	43.4	45.4	44.5	41.0	112.0
6143	23257	Smith Sel. S-31-51				48.4	30.0	54.8				44.4	128.0
6127	23258	Wintex					35.4	63.6	58.5	48.0	44.3	50.0	131.9
5902	23241	Bailey					29.7	55.1	46.8	40.7	44.7	43.4	114.5
6498	24933	Ferguson							48.4	40.9	46.4	45.2	117.7
6499		Texan							49.7	40.9	42.6	44.4	115.6
		Harlan Hybrid Sel. 1-31-79					35.3	47.7				41.5	111.9
		Harlan Hybrid Sel. 1-31-84				33.4	35.5					34.4	119.4
6502		Harlan Hybrid Sel. 1-32-103							45.4	47.4	46.8	46.5	121.1
6500		Harlan Hybrid Sel. 1-33-179							43.1	42.8	43.0	43.0	112.0
6501		Harlan Hybrid Sel. 1-33-249							48.9	42.6		45.8	116.8
646	27016	Tenkow									48.9	48.9	132.2

*Tennessee Winter C. I. 6125, C. I. 3545, and Finley are used as standard varieties from which to figure percentage ratings for other varieties grown for a shorter period of years.

Yield Data for Nursery Tests of Barley: In addition to the field plat tests of barley, nursery tests and breeding work to produce new strains have been conducted. During the early periods much of the work was devoted to strains of the Tennessee Winter type. No definitely superior strains were isolated and increased to varieties. For this report only those strains of sufficiently superior yield to be tested for a number of years and distinct varieties under test are reported. In addition to those reported a large number of strains were tested from one to several years. Figure 8 shows the manner of testing numerous new strains in preliminary nursery tests in comparison with standard varieties.

During the past 10-year period, 1931 to 1940, the most promising strains in the nursery tests have been the intermediate winter strains similar to Wintex and from which this new variety was developed. In recent years numerous strains of hybrid origin have been tested. These Harlan Hybrid strains have been selected from a bulk hybrid made up of numerous crosses prepared by Dr. H. V. Harlan, Principal Agronomist, in charge of barley investigations, United States Department of Agriculture. The smooth awn strain Texan was selected from this hybrid. Other promising smooth awn strains under test are Harlan Hybrid 1-33-179 and 1-35-416.

Table 4 reports the yield of commercial varieties and the more promising new strains tested in the nursery experiments during the period 1931 to 1940. The percentage rating for each variety is based on the comparative yield of a given variety with that of the first five varieties recorded in the table which have been grown continuously during the period.

Yield Data for Spring Sown Barley Grown in Nursery Plats, Denton, Texas. Spring type barley varieties were tested rather intermittently previous to 1930. Some were fall planted and others were spring planted. From fall seeding, spring type barley strains quite often winterkill.

Since 1930 the most promising spring type strains together with a few intermediate winter types have been planted continuously. Five varieties, three true spring and two intermediate winter strains are used as standards with which to compare other strains grown for shorter periods.

The highest yields among the true spring type barleys have been produced by Stavropol and Vaughn. Since 1934 the highest yield has been produced by Amarillo Selection S-31-68 which is a pure line selection from a farm in the Texas Panhandle. The intermediate winter strains Wintex and Texan have also given good yields from spring seeding.

Barley Variety Tests at U. S. Cotton Field Station, Greenville, Texas*

Since 1938, small grain variety trials have been conducted at Greenville, Texas, in cooperation with the U. S. Cotton Field Station. Greenville is

*Experimental data presented through the courtesy of Mr. D. R. Hooton, Superintendent.

Table 4. Yields of Fall Sown Barley Varieties and Strains Grown in Replicated Nursery Plats 1931 to 1940, Inclusive, Denton, Texas.

Number		Variety or strain	Yield of grain—bushels per acre										Average	Percentage of standards
C. I.	T. S.		1931	1932	1933	1934	1935	1936	1937	1938	1939	1940		
5901	12576	Finley*	38.9	42.6	34.6	26.3	30.4	33.1	56.7	45.6	59.5	62.4	43.0	113.2
5902	23241	Bailey*	50.9	51.0	31.2	31.0	28.9	39.0	52.8	44.8	56.6	68.2	45.4	119.5
6125	15825	Tennessee Winter*	34.1	40.5	34.0	29.7	26.1	28.4	56.0	37.2	46.1	53.2	38.5	101.3
3545	15826	Tennessee Winter*	30.8	41.3	33.8	21.6	23.2	29.6	58.8	53.3	37.9	54.8	38.5	101.3
3384	15831	Tennessee Beardless No. 5*	15.9	26.4	15.8	12.4	10.8	23.4	41.4	25.3	35.9	38.3	24.6	64.7
2159	15839	Wisconsin Winter	32.2	32.7	25.0	25.8	18.0	34.4					28.0	91.8
		Tennessee Winter 643-33	36.5	36.2	34.5	25.1	18.2	30.0					30.1	98.7
6126	18561	Tennessee Winter					16.2	28.7	53.8	38.3	43.9	41.3	37.0	88.3
6142	23256	Tennessee Winter, Goodwell					28.6	39.3	58.0				42.0	117.0
6128	23259	Tenn. Winter, Winkelman					24.5	36.1	58.0	46.3	60.1	67.2	48.7	116.2
6141	23255	Tennessee Winter, Tulia				28.1	36.1	42.8	49.8				39.2	118.8
6498	24933	Ferguson								45.2	51.3	61.5	52.7	110.0
4581	23252	Purdue No. 21						33.1	63.2	50.0	53.8	53.3	50.7	111.4
6051	24941	Missouri Early Beardless							47.2	35.4	31.4	45.0	39.8	80.9
646	27016	Tenkow										69.0	69.0	124.5
	27015	Oklahoma Manchuria										65.3	65.3	117.9
		Bailey Selection S-31-15			39.6	33.6	36.8	48.0	57.5	49.1	56.7	59.4	47.6	124.6
		Bailey Selection S-31-18			42.2	31.9	33.4	45.9	61.0	53.4	67.5	70.2	50.7	132.7
	27017	Smith (Original)									59.9	69.8	64.8	126.3
6143	23257	Smith Selection S-31-51			37.1	31.6			58.8	46.9	61.2	61.4	49.5	118.4
6127	23258	Wintex				37.6	41.0	51.6	65.2	58.0	69.2	65.5	55.4	140.6
6499	28348	Texan						36.6	75.0	60.7	55.9	69.5	59.5	130.8
		Harlan Hybrid Sel. 1-31-79			37.6	23.2	14.3	29.7	50.6				31.1	96.0
		Harlan Hybrid Sel. 1-31-84			30.5	26.5	25.6	36.7					29.8	109.6
6502		Harlan Hybrid Sel. 1-32-103							65.8	60.4	73.8	58.1	64.5	131.1
		Harlan Hybrid Sel. 1-33-81						40.1	66.2		63.5	70.8	60.2	129.2
		Harlan Hybrid Sel. 1-33-106						33.4	66.0	52.4	53.4	61.6	53.4	117.4
		Harlan Hybrid Sel. 1-33-110						36.7	68.1	55.8	58.9	55.6	55.0	120.9
6500		Harlan Hybrid Sel. 1-33-179						42.6	70.2	46.8	60.8	63.6	57.0	125.3
		Harlan Hybrid Sel. 1-33-204						40.5	63.2	51.4	57.4	54.2	53.3	117.1
		Harlan Hybrid Sel. 1-33-214						42.4	64.0	55.0	61.3	56.2	55.8	122.6
		Harlan Hybrid Sel. 1-33-246						41.5	59.5	51.0	61.5	59.3	54.6	120.0
6501		Harlan Hybrid Sel. 1-33-249						45.8	66.8	51.7	60.6	60.7	57.1	125.5
		Harlan Hybrid Sel. 1-35-416								51.5	64.6	70.5	62.2	129.9

*Standard varieties. Mean of these five is used as standard with which to compare other varieties grown for shorter periods.

Table 5. Yields of Spring Type Barley Varieties From Spring Seeding in Replicated Nursery Plats at Texas Substation No. 6, Denton, Texas.

Number		Variety or strain	Yield of grain—bushels per acre									Average	Percentage of standard varieties
C. I.	T. S.		1930	1933	1934	1935	1936	1937	1938	1939	1940		
1367	15830	Vaughn*	21.3	28.2	32.0	46.7	31.6	42.3	39.6	35.5	50.2	36.4	105.8
2103	15828	Stavropol*	24.0	34.5	38.0	38.8	30.5	43.2	44.7	38.9	51.9	38.3	111.3
690	15829	Coast*	16.2	30.4	25.1	36.3	32.0	43.0	29.0	40.6	48.2	33.4	97.1
5901	12576	Finley*	37.8	29.3	21.3	26.6	32.0	23.1	15.0	33.2	67.2	31.7	92.2
5902	23241	Bailey*	36.3	36.7	29.6	35.0	27.3	22.4	12.2	33.7	57.9	32.3	93.9
4118	15840	Atlas	23.2	30.8	30.0							28.0	95.2
261	15842	Club Mariout	19.0	27.7	25.1	33.8						26.4	84.6
257	15841	Tennessee Winter (Spr. type)	21.4	32.3	24.3							26.0	88.4
6129	23254	Black Barley			23.3	46.4	33.8	39.6	40.4	38.6		37.0	113.5
	27017	Smith Barley (Original)								29.6	52.2	40.9	89.3
6143	23257	Smith Selection S-31-51						36.8	16.7	38.4		30.6	92.4
		Smith Selection S-31-57			32.1	30.9						31.5	95.5
6127	23258	Wintex			38.3	45.9	41.0	37.0	26.2	46.9	71.0	43.8	122.0
		Bailey Selection S-31-15							14.9	39.3		27.1	84.2
		Bailey Selection S-31-18							23.2	47.2		35.2	109.3
		Amarillo Selection S-31-68			37.7	50.6	40.0	43.6	25.0	52.6	69.2	45.5	126.7
4666		Wisconsin Pedigree 5-1			35.9	45.0						40.4	122.4
5028	23253	Wisconsin Pedigree 37			31.4	50.0	31.5	37.7				37.6	114.6
		Wisconsin Pedigree 37-4					39.9	40.4				40.2	122.6
5105	23253	Wisconsin Pedigree 38			31.0	43.3	27.6					34.0	105.6
		Harlan Hybrid 1-31-45			27.2	51.2	35.6	47.4	35.0	51.0	63.3	44.4	123.7
		Harlan Hybrid 1-31-83			28.7	34.2	36.8	41.2	18.9	38.4		33.0	101.2
6499	28348	Texan							41.2	45.6	61.0	49.3	123.6
6500		Harlan Hybrid 1-33-179							38.4	44.3	64.8	49.2	123.3
		Harlan Hybrid 1-33-326					40.4	37.9	36.2	44.3	60.3	43.8	118.4
		Harlan Hybrid 1-33-332					44.7	37.6	32.1	47.6	61.9	44.8	121.1
		Harlan Hybrid 1-33-364					35.1	37.6	30.2	45.4		37.1	114.2
		Harlan Hybrid 1-33-413					39.1	38.6	32.6	54.6	59.8	44.9	121.4
		Harlan Hybrid 1-33-437					41.1	43.6	34.0	51.8	65.8	47.3	127.8
1311		Flynn									61.0	61.0	110.7
6573		Arivat									56.2	56.2	102.0
5064		Ezond									59.0	59.0	107.1
1111		Chevron									37.8	37.8	68.6
5267		Peatland									41.6	41.6	75.5

*Standard varieties. Mean of these five varieties is used to compare other varieties grown for shorter periods.

located in northeast Texas, about 50 miles northeast of Dallas, and about 70 miles east of Denton. Cotton is the principal cash crop, although in recent years larger acreages have been devoted to corn and small grains. The average yearly rainfall is 37.27 inches, according to the U. S. Weather Bureau.

Six varieties of barley have been included in the field plat tests. Wintex and Finley have produced the highest average yields. The average yields of barley for this period are superior to the average of 21.4 bushels per acre for corn during the same period.

Table 6. Yields of Fall Sown Barley Varieties, 1938 to 1940, Inclusive, U. S. Cotton Field Station, Greenville, Texas.

Number		Variety	Yield of grain—bushels				Percentage of standard varieties
C. I.	T. S.		1938	1939	1940	Average	
6125	15825	Tennessee Winter*	25.0	30.8	22.1	26.0	90.3
6127	23258	Wintex*	24.7	36.7	33.6	31.7	110.1
5901	12576	Finley	--------	35.8	28.4	32.1	104.2
6499	28348	Texan	--------	30.8	26.8	28.8	93.5
6500		Harlan Hybrid 1-33-179	--------	36.8	24.8	30.8	100.0
6051	24941	Missouri Early Beardless	23.7	--------	20.0	21.8	82.9

*Standard varieties used as a basis for computing percentage ratingss of other varieties grown for shorter periods.

Barley Variety Tests at Texas Substation No. 5, Temple, Texas*

Temple is located in central Texas near the southern end of the central Texas blackland area. The principal crops are cotton, corn, small grains, and grain sorghum. Leaf and stem rust are important factors in small grain production in this area, often causing serious losses. Intensive breeding work to produce new rust resistant small grain varieties for this and other areas is under way. Since barley is earlier in maturity than other small grains it usually escapes serious damage by rust.

Barley has been grown at the Temple Substation since 1929 but only in a limited way. Since 1938 a replicated nursery test of nine varieties has been grown. The most promising strains tested are of hybrid origin. The smooth awn strain, Texan, has been among the most productive and is being increased for distribution in that area. These hybrid strains have been more productive than Tennessee Winter and much more productive than the beardless varieties. The yields of these improved varieties are superior to corn or grain sorghum during the same three-year period.

*Varietal tests conducted and reported herewith through the courtesy of Mr. C. H. McDowell, formerly Superintendent and Mr. H. O. Hill, Superintendent Substation No. 5.

Table 7. Yields of Fall Sown Barley Varieties, 1929 to 1940, Inclusive, Texas Substation No. 5, Temple, Texas.

Number		Variety or strain	Yield of grain—bushels per acre									Total	Average for years grown
C. I.	T. S.		1929	1930	1931	1932	1933	1934	1938	1939	1940		
1367	15830	Vaughn		0		43.7						43.7	21.9
261	15842	Club Mariout		0								0	0
4118	15840	Atlas		0								0	0
690	15829	Coast		0		36.0		23.2				59.2	19.7
2103	15828	Stavropol		0				30.2				30.2	15.1
	13621	Ferguson 1812	44.6	0	72.4							117.0	39.0
		Tennessee Winter 643-33		0								0	0
		Tennessee Winter 643		0								0	0
257	15841	Tennessee Winter		0								0	0
3545	15826	Tennessee Winter		0				16.0	24.0	28.6	23.2	91.8	18.4
6125	15825	Tennessee Winter							22.2	20.0	20.6	62.8	20.9
2159	15839	Wisconsin Winter		0				12.6				12.6	6.3
3384	15831	Tennessee Beardless No. 5							11.4	19.2	15.0	45.6	15.2
6051	24941	Missouri Early Beardless							15.9	18.3	15.0	49.2	16.4
5901	12576	Finley		0			0.7	36.0	7.2	32.0	19.2	95.1	15.8
5902	23241	Bailey							12.6	35.8	17.6	66.0	22.0
6127	23258	Wintex							13.0	37.3	19.4	69.7	23.2
6143	23257	Smith Selection S-31-51							10.8	35.0	19.0	64.8	21.6
6502		Harlan Hybrid 1-32-103							31.5	41.3	18.8	91.6	30.5
6499	28348	Texan							22.8	41.0	20.4	84.2	28.1
6500		Harlan Hybrid 1-33-179							29.0	32.6	18.4	80.0	26.7

Barley Variety Tests at Texas Substation No. 16, Iowa Park, Texas*

The Iowa Park Substation is located in the Wichita river valley about 16 miles west of Wichita Falls, Texas. The annual rainfall is 30.53 inches but additional moisture is supplied to crops on the station by irrigation from Lake Kemp. The principal crops of this region are small grains, cotton, grain sorghum and pasture. Extensive areas are devoted to ranching.

Small grain experiments have been conducted since 1932. During the nine-year period, fall sown barley and oats have been lost from winter killing in two seasons. In computing averages, these complete failures are included although under field conditions another crop could have been planted on the land. Finley barley is the only variety grown continuously during the period. Other varieties are compared with Finley on a percentage basis. Although Bailey barley has the best record for the period it was grown, this variety is not available commercially. Leading varieties in the test are Wintex and Texan, which are recommended for this area.

In comparison with barley, corn produces low yields in this area. Grain sorghum produces yields approximately equal to that of barley.

Barley Variety Tests at Texas Substation No. 12, Chillicothe, Texas†

The Chillicothe Substation is located on the rolling plains area of central west Texas about 70 miles west of Wichita Falls, Texas. The mean annual precipitation at the Substation is 24.38 inches. Leading crops in that area are cotton, grain sorghum and wheat.

Tests of barley varieties have been conducted since 1931. Spring sown tests were made from 1931 to 1935 but were discontinued at that time because of poor yields and inadequate facilities for handling the crop. Since 1938 tests of fall sown barley have been made.

From spring seeding, the leading varieties were Smyrna, Flynn, and Trebi. The yields of spring sown barley were much lower than those recently obtained for fall sown barley. From fall seeding Wintex and Texan are the most productive and are recommended for that area. Average production of Wintex compares favorably with that of grain sorghum for the same years and is much higher than that of corn. A mid-winter seeding of Wintex in 1940 also produced a good crop.

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*Experimental data presented through the courtesy of Mr. L. E. Brooks, Superintendent, and Mr. C. H. McDowell, formerly Superintendent of Substation No. 16.

†Experimental data obtained and presented herewith through the courtesy of Mr. J. Roy Quinby, Superintendent Texas Substation No. 12.

Table 8. Yields of Fall Sown Barley Varieties at Texas Substation No. 16, Iowa Park, Texas, 1932 to 1940, Inclusive.

Number		Variety	Yield of grain—bushels per acre									Average	Percentage of standard variety
C. I.	T. S.		1932	1933	1934	1935	1936	1937	1938	1939	1940		
5901	12576	Finley*	48.6	0	43.8	0	61.0	29.4	15.1	43.2	29.0	30.0	100.0
1367	15830	Vaughn	29.3	0	30.4							19.9	64.6
261	15842	Club Mariout	30.0	0	39.6							23.2	75.3
690	15829	Coast	37.0	0	36.4							24.5	79.5
2103	15828	Stavropol	27.7	0	48.3							25.3	82.1
6125	15825	Tennessee Winter	30.9	0	33.1							21.3	69.2
3545	15826	Tennessee Winter				0	54.1	27.8	12.8	44.1	24.7	27.2	91.9
6126	18561	Tennessee Winter				0	53.8	25.3	13.7			23.2	87.9
2159	15839	Wisconsin Winter				0	58.4	29.1				29.2	97.0
5902	23241	Bailey				0		38.6	16.8			18.5	125.0
6127	23258	Wintex							15.2	48.2	28.6	30.7	105.5
6499	28348	Texan								38.6	24.7	31.6	87.5
6500		Harlan Hybrid 1-33-179								34.8	25.4	30.1	83.4

*Standard variety used as basis for calculating percentage ratings for varieties grown for shorter periods.

Table 9. Yields of Fall and Spring Sown Barley Varieties, 1931 to 1940, Inclusive, Texas Substation No. 12, Chillicothe, Texas.

Number		Variety	Yield of grain—bushels per acre								Total	Average for years grown
C. I.	T. S.		1931	1932	1933	1934	1935	1938	1939	1940		
		Spring Seeded										
1367	15687	Vaughn	19.0	14.2	8.1	7.6	9.2	--------	--------	--------	58.1	11.6
936	15688	Trebi	23.6	31.5	4.5	5.9	6.1	--------	--------	--------	71.6	14.3
1311	15689	Flynn	22.2	23.0	8.1	9.2	11.3	--------	--------	--------	73.8	14.8
	15691	White Smyrna	24.6	26.2	7.4	9.2	8.0	--------	--------	--------	75.4	15.1
	15690	Oderbrucker	13.7	12.2	1.6	3.3	2.6	--------	--------	--------	33.4	6.7
	15693	Blackhull	21.0	13.1	5.0	10.8	7.1	--------	--------	--------	57.0	11.4
	15694	Odessa	18.4	20.0	3.7	5.6	10.1	--------	--------	--------	57.8	11.6
690	15692	Coast	19.3	14.0	5.6	7.3	9.7	--------	--------	--------	55.9	11.2
2103	15695	Stavropol	15.3	21.3	7.9	7.0	11.2	--------	--------	--------	62.7	12.5
261	15696	Club Mariout	18.0	15.1	8.1	9.4	9.4	--------	--------	--------	60.0	12.0
		Tennessee Winter	--------	39.5	0	8.9	0	--------	--------	--------	48.4	12.1
		Fall Seeded										
3545	15826	Tennessee Winter	--------	--------	--------	--------	--------	21.3	27.8	3.4	52.5	17.5
6125	15825	Tennessee Winter	--------	--------	--------	--------	--------	23.8	--------	--------	23.8	23.8
6126	18561	Tennessee Winter	--------	--------	--------	--------	--------	15.8	--------	--------	15.8	15.8
6142	23255	Tennessee Winter, Goodwell	--------	--------	--------	--------	--------	28.1	--------	--------	28.1	28.1
6007		Ward, Woodward, Okla.	--------	--------	--------	--------	--------	26.8	34.8	4.7	66.3	22.1
3384	15831	Tennessee Beardless No. 5	--------	--------	--------	--------	--------	11.4	--------	--------	11.4	11.4
6051	24941	Missouri Early Beardless	--------	--------	--------	--------	--------	10.3	18.8	6.2	35.3	11.8
5901	12576	Finley	--------	--------	--------	--------	--------	28.3	32.0	2.8	63.1	21.0
6127	23258	Wintex	--------	--------	--------	--------	--------	32.6	40.0	5.0	77.6	25.9
4581	23252	Purdue No. 21	--------	--------	--------	--------	--------	19.9	--------	--------	19.9	19.9
6499	28348	Texan	--------	--------	--------	--------	--------	27.9	40.5	5.6	74.0	24.7
6500		Harlan Hybrid 1-33-179	--------	--------	--------	--------	--------	30.3	38.3	5.2	73.8	24.6

Barley Variety Tests at Amarillo Experiment Station, Amarillo, Texas*

Amarillo is located on the high plains area of west Texas. The elevation is 3657 feet and the mean annual precipitation is 21.01 inches, according to the U. S. Weather Bureau. Principal crops in this area are wheat and grain sorghum. Extensive areas are devoted to grazing and live stock raising is one of the principal sources of income.

The experiment station was established in 1938 under the supervision of the Soil Conservation Service, United States Department of Agriculture. Cereal experiments are conducted cooperatively with the Texas Experiment Station. The station is located 14 miles west of Amarillo. Previous to 1939 barley trials were conducted in 1934 at the Price Memorial College, Amarillo, Texas.

Variety tests have been made from both fall and spring seeding and under dry land and irrigated conditions. Tests to date indicate that fall sown barley is more productive than spring sown barley but may be lost from winterkilling. Wintex has been outstanding in production from fall seeding but is not as winter hardy as Tennessee Winter types. The most productive spring sown strains are Amarillo Selection S-31-68 and Harlan Hybrid 1-31-45. These are slightly superior to the best commercial varieties Vaughn and Stavropol. Breeding work is now under way to produce superior varieties for this area.

Barley Variety Tests at U. S. San Antonio Field Station, San Antonio, Texas†

Through the courtesy of the Division of Western Irrigation Agriculture, United States Department of Agriculture, data obtained at the U. S. San Antonio Field Station, San Antonio, during the period 1919 to 1932 are included in this Bulletin.

Only a few varieties were tested at this station and all were fall seeded as is the practice with small grains in this area. A complete failure of barley was recorded in 1925 while the highest yield reported was 91.2 bushels per acre for Vaughn barley in 1931. The average yield of Texas Winter is 23.0 bushels for a 13-year period. Vaughn barley, grown during a four-year period 1929 to 1932, produced an average yield of 36.9 bushels per acre. Under the same conditions Texas Red Rustproof oats produced an average of 32.9 bushels per acre for the 13-year period.

Although the data for this station are rather limited, it would appear that an early maturing spring type barley is best suited in this area since

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*Experimental data presented through the courtesy of Mr. David A. Reid, Agronomist in charge of small grain experiments at the Amarillo Experiment Station, Amarillo, Texas.

†Data presented through the courtesy of Mr. S. H. Hastings, Senior Agronomist, Division of Western Irrigation Agriculture. Experiments at San Antonio in charge of Mr. G. T. Ratliffe, Superintendent.

Table 10. Yields of Fall and Spring Sown Barley Varieties at Amarillo, Texas.

Number		Variety or strain	Yields of grain in bushels per acre						
			Dry land				Irrigation		
C. I.	T. S.		1934	1939	1940	Average	1939	1940	Average
		Spring seeding							
1367	15830	Vaughn	15.2	3.3	7.1	8.5	21.5	27.9	24.7
690	15829	Coast	17.6	6.3	0	8.0	15.5	22.9	19.2
2103	15828	Stavropol	19.7	4.3	0	8.0	14.4	26.5	20.4
5901	12576	Finley	9.5	2.7	0	4.1	6.8	10.6	8.7
5902	23241	Bailey	12.1	4.5	0	5.5	10.4	7.4	8.9
261	15842	Club Mariout	16.5	----------	5.1	10.8	----------	26.5	26.5
4118	15840	Atlas	11.7	----------	10.2	11.0	----------	28.8	28.8
4666		Wisconsin Pedigree 5-1	5.5	----------	----------	5.5	----------	----------	----------
5028	23253	Wisconsin Pedigree 37	6.4	----------	----------	6.4	----------	----------	----------
5105	23253	Wisconsin Pedigree 38	4.4	----------	----------	4.4	----------	----------	----------
6127	23258	Wintex	----------	4.8	0	2.4	16.2	14.9	15.6
6129	23254	Black Barley	----------	7.4	0	3.7	20.8	25.3	23.1
		Amarillo Selection S-31-68	----------	13.7	0	6.9	30.3	22.7	26.5
		Harlan Hybrid 1-31-45	----------	12.8	0	6.4	32.9	24.5	28.7
		Harlan Hybrid 1-31-83	----------	8.3	0	4.2	19.9	10.3	15.1
		Harlan Hybrid 1-33-332	----------	7.3	0	3.7	22.9	14.3	18.6
6500		Harlan Hybrid 1-33-179	----------	----------	0	0	20.7	10.4	15.6
		Harlan Hybrid 1-33-413	----------	----------	0	0	26.3	13.4	19.9
		Fall seeding							
6127	23258	Wintex	----------	31.3	8.7	20.0	43.6	39.4	41.5
	24932	Ward	----------	21.7	6.7	14.2	27.1	32.7	29.9
3545	15826	Tennessee Winter	0	14.0	5.8	6.6	11.6	27.9	19.8
6125	15825	Tennessee Winter	0	18.5	4.2	7.6	26.1	22.7	24.4
6051	24941	Missouri Early Beardless	----------	14.2	6.3	10.2	9.7	11.3	10.5
6499	28348	Texan	----------	10.6	5.8	8.2	15.7	35.7	25.7
6500		Harlan Hybrid 1-33-179	----------	7.9	4.6	6.2	9.8	31.9	20.9

the winters are mild enough that winter killing seldom occurs. Further work on barley for the southern part of Texas has recently been undertaken by Mr. E. S. McFadden, Associate Agronomist, United States Department of Agriculture, stationed at College Station, Texas.

DISEASES OF BARLEY

The most common diseases of barley in Texas are covered smut, seedling-infecting loose smut, floral-infecting loose smut, leaf rust, stem rust, stripe, net blotch and mildew. In central Texas, the only diseases which are present each season are the barley smuts. The amount of infection is usually not severe. In most of the barley-growing areas, barley matures sufficiently early that rust is seldom a factor in production. Barley grown in south central or south Texas may be seriously injured by rust. Furthermore it may serve as a host for the overwintering of wheat stem rust. Barley stripe and net blotch have been observed in both north central and south central Texas in recent years, and may become more important if the acreage of barley is increased. Mildew causes damage in certain seasons.

Covered Smut

The spores of covered smut are carried on the seed. If the grain is not treated before seeding, the spores germinate and infect the seedling barley plants. The fungus then grows within the plants forming a mass of smut at ripening time in place of the normal heads as shown in figure 9. Covered smut may be controlled by treating the seed with New Improved Ceresan, a chemical dust or with liquid formaldehyde. **The dust is poisonous and the precautions noted by the manufacturer should be carefully observed.** The dust is applied at the rate of only one-half ounce per bushel by means of a gravity or rotary seed treater or simply by adding the proper amount of dust to a pile of grain and shoveling it over until the dust and grain have been thoroughly mixed. Mixing in the drill box is not recommended. A simple home-made machine, known as The Minnesota Seed Grain Treater[1] has proved highly satisfactory for applying the dust. With this treater two men can treat upwards of 40 bushels of seed an hour. The total cost of materials for the treater is not likely to run over $3.50. A home-made duster consisting of a rotating barrel with a baffle board[2] also may be used. For large quantities of seed, a cement mixer or a commercial dusting machine is

[1]Directions for its construction and use are given in United States Department of Agriculture Miscellaneous Publication No. 330 entitled "The Minnesota Seed Grain Treater."

[2]Its construction and use are described in United States Department of Agriculture Miscellaneous Publication No. 199 entitled, "Barley Diseases Controlled by Seed Treatment."

Table 11. Yields of Barley Varieties at U. S. San Antonio Field Station, San Antonio, Texas.

Variety	S. A. No.	Yield per acre—bushels														Percentage of Texas Winter for year grown
		1919	1920	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	Average	
Texas Winter	*	41.1	25.8	18.1	7.3	29.2	0.0	37.7	19.7	9.1	15.6	11.1	68.4	16.5	23.0	100.0
Vaughn	3403	------	------	------	------	------	------	------	------	------	22.7	11.3	91.2	22.3	36.9	132.2
Hannchen	2802	------	------	------	------	42.7	0.0	24.4	14.4	15.1	17.8	0.0	52.7	14.1	20.1	87.4
Trebi	3405	------	------	------	------	------	------	------	------	------	8.3	9.3	54.6	3.2	18.9	51.1

*Seed obtained on local market each season till 1926. Beginning in 1926 seed was saved from station plantings.

preferable. Several satisfactory seed-treating machines can be purchased on the market at reasonable cost. Directions for applying New Improved Ceresan or other dust treatments are given on the label of each can.

Liquid formaldehyde treatment occasionally causes some injury to germination, especially when not properly applied, when sowing is too long delayed after treatment, or when the seed is sown in dry soil. For these reasons dust treatments are to be preferred although the cost of treatment may be slightly more. Treatment with liquid formaldehyde costs about 1 cent per bushel, but its application is more laborious and disagreeable, and it is less effective than dust treatments. The method is as follows: First clean the seed thoroughly and put in loosely woven burlap or gunny bags half filled and tied at the top. Mix 1 pint of commercial formaldehyde in 40 gallons of water in a tub, tank, or barrel. Immerse the half-filled sacks of grain in this solution for 1 hour. Then let them drain a few minutes, and spread out the grain in a thin layer on a clean floor or canvas to dry. Stir the grain occasionally to hasten

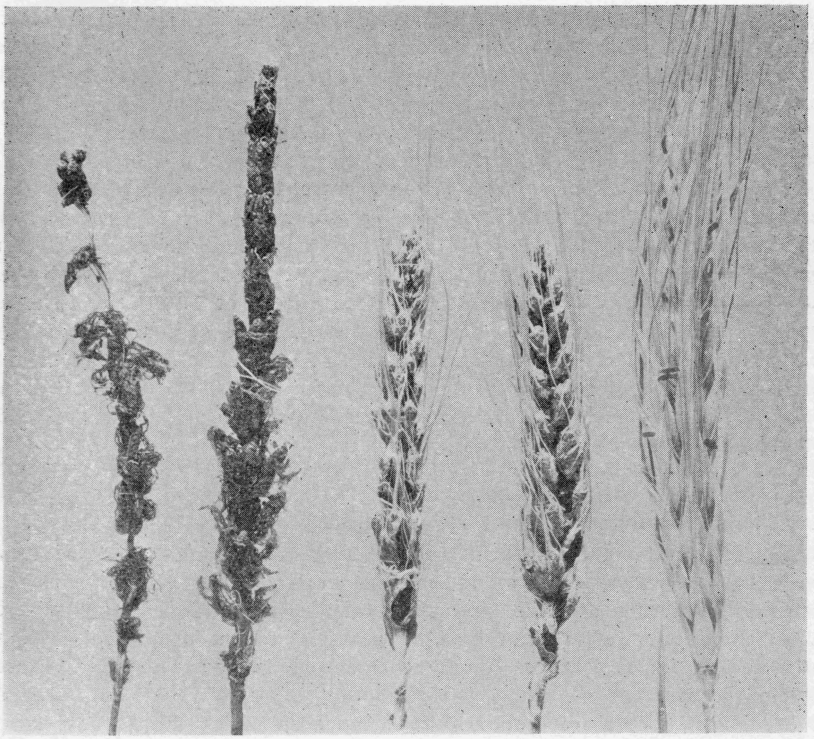

Figure 9. Left to right—Two heads infected with loose smut, two infected with covered smut, and one healthy head of barley.

drying. Sow as soon as it is dry enough to flow readily through a drill. Make allowance for its swollen condition by setting the drill to sow about one-fourth more per acre. If sowing is delayed, it is important that the treated seed be thoroughly dried to prevent injury. **CAUTION**—Avoid freezing or heating of the wet seed, or sowing it in extremely dry soil. Care should be taken in handling the grain to keep formaldehyde solution out of the eyes. Treatment of barley by the formaldehyde sprinkle method, commonly used in Texas for control of oats smut, is not effective in controlling smut of barley.

Loose Smut

Two loose smuts of barley occur in Texas. They are similar in appearance. Both convert the barley heads into a dusty mass of smut as shown in figure 9. One type is a seedling-infecting fungus which may be easily controlled through seed treatment as described for covered smut. The other type is caused by a floral-infecting fungus which is very difficult to control. Growers should send samples of the smut to the United States Department of Agriculture, Washington, D. C., or to the Texas Agricultural Experiment Station, College Station, Texas, for identification before attempting to treat their seed. If the seedling-infection type is present, the smut may be easily controlled by ceresan or formaldehyde. If the floral-infecting smut is present the following treatment is necessary: Fill burlap bags half-full of seed and soak in water at room temperature for 5 to 6 hours. Immerce in a vessel of water at 120 F for two minutes to warm the seed; then place in water at 126 F for 13 minutes. The temperature must be maintained at an even rate and must not exceed or fall below the stated temperature. If the temperature is below 126 F the fungus will not be killed, if in excess of 126 F the seed as well as the fungus may be killed. Seed should be cooled immediately on removal by placing in cool water. Spread out to dry. The treatment is usually difficult to carry out on the farm and, if possible, farmers should work cooperatively. If a creamery is available the large vats and steam heat make treating fairly easy.

Rust

Leaf rusts are seldom factors in production of barley in central or west Texas because the crop matures so early in the season. In south central Texas it is of some importance and in south Texas may become a serious economic factor. The only practical means of control is that of breeding for resistance. Work of this type is under way at College Station, Texas.

Stem rust is of more economic importance on barley than is leaf rust. Stem rust of wheat attacks barley and in the south central part of the state may cause serious losses. All the varieties of barley grown in

Texas are susceptible to stem rust but breeding work to develop resistant varieties is under way. No other means of control is practicable.

Stripe

Barley strips appears as long, yellow to brown colored stripes on the leaves of the plant. The leaves shred or tear along these diseased areas, lose their ability to function, and the plants become so stunted that the heads either fail to emerge from the boot or emerge discolored and shrunken. The yield and quality of the grain are materially reduced. The disease is seed borne and may be controlled by treating the seed with New Improved Ceresan or other mercuric dusts. The varieties now available are susceptible.

Net Blotch

This disease is somewhat similar and may easily be confused with barley stripe. It causes brown colored areas on the leaves which show a net-like pattern. The leaves do not shred or tear as in the case of barley stripe. The disease cannot be fully controlled by seed treatment but may be reduced. None of the adapted varieties are resistant although Texan is less susceptible than Wintex.

Mildew

Mildew may cause some damage to barley during periods of warm, damp weather. It may be recognized by the familiar white growth on the leaves. Most varieties are susceptible but Texan barley is resistant.

SUMMARY

Barley is at present one of the minor farm crops of Texas. The average production and farm value of barley in Texas is greatly exceeded by *cotton, corn, oats,* wheat, and grain sorghum. Recent development of new varieties better adapted to Texas conditions, may be expected to cause some increase in barley production. There are two distinct barley growing areas in the state. The principal winter barley area is located in central and north central Texas. On the high plains of the Texas Panhandle, barley is grown from both fall and spring seeding, the majority being spring sown.

The yields of barley, at the Texas Experiment Substations reported in this bulletin, compare favorably with those of corn and grain sorghum grown under the same conditions. In addition to the grain production, barley provides abundant winter pasture for live stock and provides a winter cover crop to prevent soil erosion during the period of highest rainfall. Barley grown in Texas is, at present, used almost exclusively for live stock feed. As a feed, it has approximately the same value

as corn and grain sorghum. It should be ground for all classes of live stock. Barley for pasture is a nutritious feed, although not quite as palatable as oats and wheat. Yields of 5 to 10 tons of green forage per acre have been recorded at Denton during the winter months. This green forage contains about 25 per cent protein (dry basis).

Barley fits into the rotation in a manner similar to other small grains. In central Texas barley commonly follows corn or cotton in the rotation. A common and inexpensive seed bed for barley is that of drilling in the cotton stalks, after a light disking or harrowing. In west Texas, barley may follow grain sorghum, fallow, or other small grains. Low yields may be expected when barley is planted in dry soil following loss of winter wheat through drought or soil blowing. Fall seeding, in a manner similar to fall wheat has given very good yields in preliminary trials at Amarillo, Texas. In central Texas barley is planted from September to November depending upon weather conditions and the needs of the farmer. If it is not sown for pasture, planting should be delayed to October 15. Spring planting should only be practiced when the fall sown crop is winter killed and this should be planted before February 15. If moisture is available, fall planting in west Texas should occur about October 1 so that the plants may become well established before winter. Spring planting is usually practiced from February 15 to March 15.

Barley is commonly harvested with a combine harvester thresher, although in central Texas, where small fields are common, the binder is used to a great extent. The new varieties Wintex and Texan are better suited to combine harvesting than the old strains of Tennessee Winter. When harvested with a combine, the grain should be fully ripe and thoroughly dry as barley with high moisture content heats easily when stored.

Barley grown in Texas is divided into three types. The true winter barleys such as Tennessee Winter are suited to fall seeding and do not head normally when spring planted. The intermediate winter types such as the new varieties Wintex and Texan are suitable for both fall and spring seeding and yet survive the winters about as often as Tennessee Winter. The true spring type barleys such as Coast, Stavropol, Flynn, etc., are suited for spring planting only, unless grown in extreme south Texas.

Varieties recommended for Texas conditions are Wintex and Texan for all of central Texas, Wintex for fall seeding in the southern part of the Texas Panhandle, and Reno and Michigan Winter for the northern part of the Texas Panhandle. For spring seeding in the Texas Panhandle very little data are available as yet. Stavropol, Coast and Flynn are probably the more desirable varieties available at present.

Detailed data on yields at Denton, Temple, Iowa Park, Chillicothe, Amarillo, and San Antonio, Texas, are presented. Wintex and Texan are among the most productive varieties from fall seeding at all of these stations. Texan barley is recommended above Wintex for the Temple

area. Both varieties produce high yields of grain and high test weight. They are both adapted to either fall or spring seeding. Texan has the additional advantage of having a smooth awn so that it is not so disagreeable in harvesting or feeding.

Wintex barley was developed at Texas Substation No. 6 from a pure line selection of a local barley. Texan barley was also developed at Texas Substation No. 6 but originated from a bulk hybrid. Its exact parentage is not known.

The principal diseases of barley in Texas are the smuts, leaf and stem rust, net blotch, and barley stripe. Methods of control for covered smut, loose smut, net blotch, and stripe are described in the text. Leaf rust and stem rust can be controlled only by breeding resistant varieties. Research work to develop new varieties resistant to both smut and rust is under way at Main Station and at several Texas Substations.