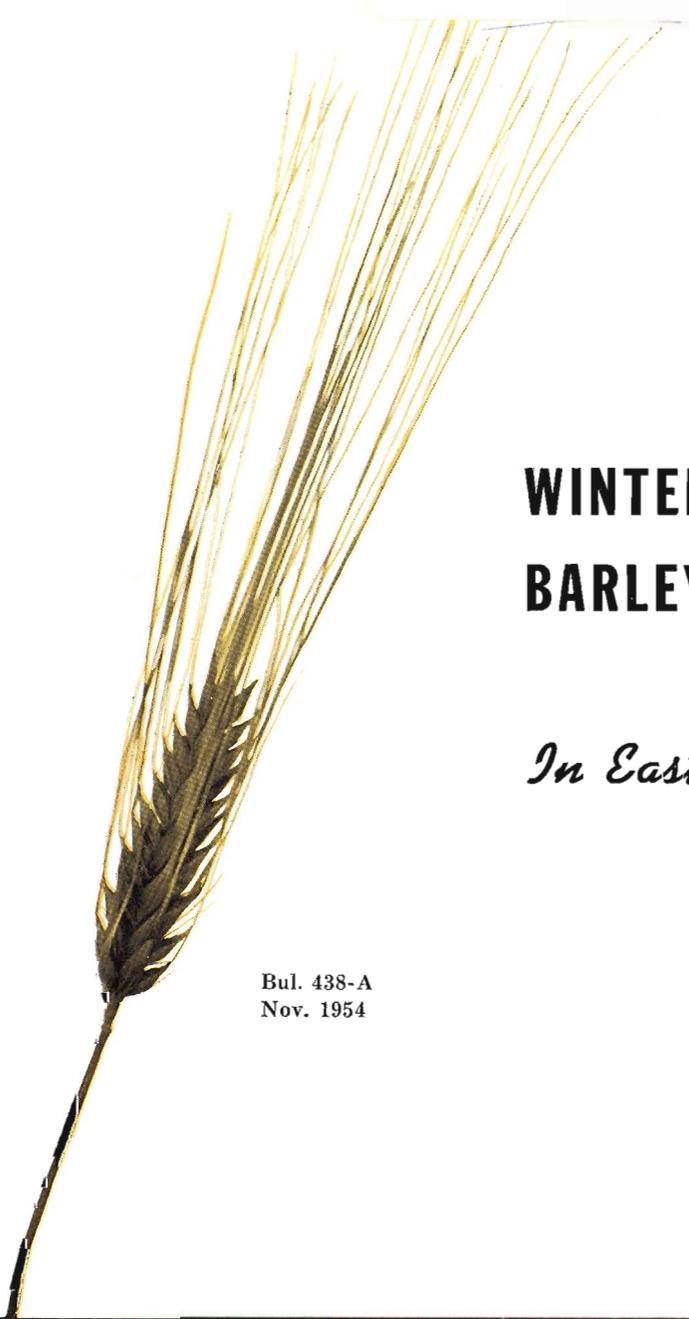


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**WINTER
BARLEY**

In Eastern Colorado

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Fort Collins

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FORT COLLINS, COLORADO

NOVEMBER 1954

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WINTER BARLEY

In Eastern Colorado

D. W. ROBERTSON, T. E. HAUS, J. F. BRANDON, and R. H. TUCKER¹

Large wheat supplies have created an interest in winter barley as a possible substitute crop. Winter barley needs about the same growing season as the wheat, requires the same equipment for production, and in favorable years is capable of protecting fallow land over the winter. Winter barley is less hardy than the recommended winter wheats. Several varieties are, however, hardy enough to produce good stands 5 years out of 9.

This bulletin reports the results of tests of winter barley at the Colorado Agricultural Experiment Station at Fort Collins and the U. S. Dry Land Field Station at Akron, Colorado.

The Experiment Station located at Fort Collins, is in the north-central part of the State. The type of soil, elevation and climatic conditions make it fairly representative of the irrigated

sections in the northeastern part of the State. Winter barley has survived winters with good stands 6 years out of 9 (table 1).

The U. S. Dry Land Field Station² is located about 4.5 miles east of Akron in Washington County, Colorado. The soil on the station is naturally fertile and varies in texture from a friable loam to a silt loam. It is locally called **hard** land and differs from the so-called sandy land in that it contains more silt and clay. The topography is nearly level to gently sloping.

The climatic conditions at Akron are similar to those of other parts of eastern Colorado. The nature and distribution of the precipitation are often limiting factors in crop production. Occasionally, injury from frost, low winter temperature, low winter precipitation, soil blowing, or hail cause serious crop losses. In the winter barley variety tests

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²The U. S. Dry Land Field Station, Akron, Colorado, is operated by the Agricultural Research Service, U.S.D.A., in cooperation with the Colorado Agricultural Experiment Station.

grown on the U. S. Dry Land Field Station, Akron, Colorado, from 1945 to 1953, inclusive, some of the hardier varieties produced good stands 5 years out of 9. Trebi, a spring barley planted in the fall, showed 20 percent survival in 1952 and 30 percent survival in 1945. In the other 4 years of the test, the survival was less than 10 percent. In 1953 no variety in the

test emerged before the first of April (see table 2), thus giving no indication of winter survival.

The data obtained from the experiments conducted on the Dry Land Station are believed to be generally applicable to nearly all dryland sections in the Plains area of Colorado except the sandy lands.

Production on Dryland

Preparation of the Soil

Several methods of preparing the soil may be used, depending on rainfall and type of soil. As with winter wheat, fallow is the most certain tillage practice for producing winter barley on the **hard** lands of the Plains of Colorado. These so-called **hard** lands constitute fully 75 percent of the surface area of eastern Colorado. Non-irrigated sandy land is not well adapted to winter barley. The so-called **hard** lands and the sandy loams can be handled to prevent blowing. The essential feature of such handling is to grow a crop and leave a stubble to keep a **small cloddy** surface and leave as much trash on the surface as possible.

Good summer fallow is land clean cultivated throughout one entire crop season until time of seeding the succeeding crop. The purpose of fallow is to store the precipitation in the soil for the use of the succeeding crop. Thus, any means that will aid percola-

tion of the rainfall into the soil is one of the prime requisites. Another is the prevention of loss of moisture after it is stored in the soil. Experimental work has shown that growing plants are the most important single cause of loss of stored soil moisture in the fallow; consequently, they should be kept off the summer fallow during the season of storage. At Akron 75 percent of the annual precipitation falls as rain from April 1 through September. Therefore, moisture-control operations should begin no later than when the first weeds become green and should continue long enough to keep them from establishing themselves. It is well to keep in mind that every pound of dry weed material allowed to develop on fallow, or any other land for that matter, will have used 500 or more pounds of soil moisture, which would be enough to produce about 1 pound of barley.

A high percentage of the summer precipitation in eastern

Colorado comes in the form of hard, beating rains. This moisture is often lost by run-off, if essential weed-control cultivations do not leave the surface in condition to hold moisture long enough to allow it to percolate into the soil. Incorporation of stubble debris in the surface of fallow land aids in preventing run-off. Shallow cultivations for weed control as planting time approaches will not only conserve moisture, but aid in providing a firmer seedbed.

In studies to determine the best date of initially working stubble land at Akron, it has been shown that little is to be gained from fall working stubble land for fallow. The latest desirable date for starting spring working of stubble land to conserve moisture was found to be June 1. When weeds and volunteer grain were allowed to grow 1 month longer to July 3, a loss of 41 percent in yield of winter wheat occurred. This indicates that preventing the use of soil moisture by plant growth is a major factor in good fallow practice and that spring working of stubble land should start with the first weed growth.

Rate and Date of Seeding

Good results have been obtained with winter barley at Akron and Fort Collins with a seeding rate of 60 pounds per acre.

The date of planting recommended is from September 1 to September 15.

Method of Seeding

The furrow drill is recommended for planting winter barley. This method places the seed in firmer soil and usually in more favorable moisture. It also throws up a higher ridge between the rows, which offers additional resistance to soil blowing. These rough top ridges and the deeper furrows are also effective in catching part of the drifting snow during the winter.

Treatment of Seed

It is advisable to treat barley seed for black loose smut, covered smut, and the stripe diseases before planting. The recommended treatment³ is as follows: Barley to be used for seed should first be carefully cleaned to remove weed seed and other foreign material. The seed is then treated with organic mercury dust at the rate recommended by the manufacturer. An excess amount may cause a reduction in germination.

Since the organic mercury dusts produce a gas that has excellent fungicidal properties, it is desirable to treat the seed at least 24 hours prior to seeding in order that the gas will have time

³Henderson, W. J., Plant Disease Handbook (Revised Edition).

to permeate the seed mass and have the desired effect on the seed-borne pathogens. Treated seed should always be kept in a dry place until planted. Because dust fungicides may be poisonous, persons who use them should always cover the nose and mouth with a dust mask or a dry cloth to prevent inhaling the chemicals. Treated grain should never be fed to animals.

Harvesting and Storage

Three methods of harvesting winter barley are common to eastern Colorado. The grain may be harvested with the binder, windrowed and combined, or combine harvested. The binder, while not used extensively on the dryland in eastern Colorado, may be used when the straw is long. Grain can be cut with the binder when the straw is yellow and when the grain contains considerable moisture and is in the tough-dough stage. It should be placed in shocks of about 8 to 10 sheaves to the shock. It is then left in the shock to go through the sweat or after-ripening stage before it is ready to thresh. The moisture content of the grain should be less than 14

percent before it is threshed and stored. If it is stored at a higher moisture content, the grain is liable to heat and damaged barley will result. The curing period in the shock takes about 2 weeks or more in a normal dry season. If the weather is wet and damp, a longer period may be necessary.

In the windrow method, the grain is cut and left in a windrow to go through the after-ripening period. The time required to ripen in the windrow is slightly less than in the shock. Generally, the grain is more mature before cutting. It is necessary to wait from 4 to 6 days after ripening before the grain is picked up with a pick-up attachment on the combine harvester and threshed.

When the combine-harvester is used, the grain should go through the after-ripening period before it is cut. This means that it is exposed to the dangers of the weather for 10 or more days longer than is necessary for windrow harvesting. As in the case of the other methods of harvesting, the moisture in the grain should be 14 percent or less before it is threshed and stored.

Experiments with Winter Barley

The experiments with winter barley were conducted in small, replicated plots. Each variety is replicated five times and the varieties are randomized within the blocks. This method allows us to get comparative yields between varieties.

The summarized yields of the winter barley variety test on the dryland are presented in table 3. Of the varieties tested for 6 years or more, Pueblo and Dicktoo have given good yields. Two other varieties, Jackson and Meimi, have also yielded well.

At Fort Collins higher yields were obtained. Pueblo gave the highest yield for the 9-year period, 1944 to 1953. Jackson, Dicktoo, and Meimi yielded less than Pueblo. Kearney shows promise for the 2-year period it was in the test.

In outstate tests (table 5) con-

ducted in the counties in cooperation with the County Agents, Pueblo yielded slightly less than Ward or Reno on the average. In the test in Kit Carson County in 1949 it was significantly out-yielded by Ward. In the other tests there was no significant difference.

Bushel Weight

The weight per measured bushel is given in table 6 for the winter barley varieties grown at Akron, Colorado. Several varieties show heavier bushel weights than Pueblo, which averaged 40.3 pounds for the 8-year period 1944-1952. Dicktoo and Meimi weighed 42.4 and 43.0 pounds,

respectively, to 40.4 pounds for Pueblo.

At Fort Collins (table 7) where moisture was more plentiful, Pueblo averaged 48.5 pounds. Dicktoo weighed slightly less and Meimi weighed 1 pound heavier than Pueblo.

Recommended Varieties

Pueblo and Kearney are the two varieties which are recommended for Colorado conditions. Foundation seed of both varie-

ties is being grown and supplies of seed are being made available for growers.

Description of Varieties

Pueblo (C.I. 8070) is a six-rowed, rough-awned, hulled barley. The heads are lax and tend to droop. The aleurone color is mixed and is being purified for white. It originated from a commercial unnamed variety grown by John Erion, near Pueblo, Colorado. Selections were made from the variety at Fort Collins where it was purified and the seed increased. The variety is more winter hardy than Ward under Fort Collins and Akron conditions.

Station in cooperation with the U. S. Department of Agriculture as a selection from Composite III (C.I. 5530). Kearney is a bearded, six-rowed, hulled, rough-awned, winter-type barley. It is more winter hardy than Pueblo under severe winter conditions.

Kearney (C.I. 7580) originated at the Nebraska Experiment

Dicktoo (C.I. 5529) originated as Selection No. 2 from an unknown cross made prior to 1917 at Dickinson, North Dakota. Dicktoo is a bearded, six-rowed, hulled, rough-awned barley. It is slightly more winter hardy than Pueblo.

Table 1.—Percentage Spring Survival of Winter Barley Varieties Grown at Fort Collins for Varying Periods of Years from 1944 to 1953, inclusive.

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Variety	C.I. No.	YEARS GROWN										Average	Pueblo Same Years
		1953 ¹	1951	1950	1949	1948	1947	1946	1945	1944			
		%	%	%	%	%	%	%	%	%	%	%	
Pueblo	8070	63	100	58	75	100	100	22	66	70	73	73	
Ward	6007	31	100	35	76	100	100	15	54	60	63	73	
Purdue Selection	6562	59	100	30	88	100	92	31	84	80	74	73	
Purdue Selection	7067	59	100	21	85	99	97	22	60	62	67	73	
Purdue 21	4581	39	96	52	69	100	97	39	54	62	68	73	
Jackson	6569	57	100	24	60	100	98	6	60	.....	68	73
Kirwin	7075	38	100	50	68	100	100	39	70	.....	71	73
Trebi (Fall sown)	936	53	64	0	0	88	11	0	48	58	36	73	
Dicktoo	5529	48	100	66	99	100	100	.....	.....	.....	86	83
Meimi	5136	42	100	22	100	100	100	.....	.....	.....	77	83
Kearney	7580	56	100	.....	.....	.....	.....	.....	.....	.....	78	81
Reno	6561	.....	.....	.....	76	100	100	12	52	58	66	72
Wintex	6127	.....	.....	.....	.....	100	72	0	62	.....	58	72

¹Emerged in April, 1953

Table 2.—Summarized Data on Percentage Stand in the Spring of Winter Barley Grown on the U. S. Dry Land Field Station, Akron, Colorado, for Varying Periods of Years from 1944 to 1953, inclusive.

Variety	C.I. No.	YEARS GROWN									Average	Pueblo Same Years
		1953 ¹	1952	1950	1949	1948	1947	1946	1945	1944		
		%	%	%	%	%	%	%	%	%	%	%
Pueblo	8070	46	86	98	40	93	89	58	84	46	71	71
Ward	6007	45	96	97	38	94	71	31	73	23	63	71
Purdue Selection	6562	45	94	92	59	96	82	48	73	46	71	71
Purdue Selection	7067	51	92	95	43	92	84	41	77	51	70	71
Purdue 21	4581	40	90	92	39	89	79	39	77	40	65	71
Jackson	6569	52	92	62	21	87	80	24	72	.....	61	74
Kirwin	7075	28	88	99	34	89	91	55	79	.....	70	74
Trebl (Fall sown)	936	31	20	2	2	.....	9	0	30	.....	13	72
Dicktoo	5529	47	98	100	100	95	98	.....	.....	.....	90	75
Meimi	5136	36	100	100	54	93	95	.....	.....	.....	80	75
Kearney	7580	60	100	.....	.....	.....	.....	.....	.....	.....	80	66
Reno	6561	.....	.....	.....	8	92	86	35	77	28	54	68
Wintex	6127	.....	.....	.....	.....	57	33	4	60	.....	38	81

¹Emerged in April, 1953

Table 3.—Summarized Yields of Winter Barley Varieties Grown at the U. S. Dry Land Field Station, Akron, Colorado, for Varying Periods of Years from 1944 to 1953, inclusive.

Variety	C.I. No.	YEARS GROWN									Average	Pueblo Same Years
		1953	1952	1950	1949	1948	1947	1946	1945	1944		
Yield in Bushels per Acre												
Pueblo	8070	1.9	9.3	20.4	29.5	55.1	64.1	14.5	63.0	34.9	32.5	32.5
Ward	6007	1.7	9.8	16.1	22.5	46.4	51.6	19.2	50.8	26.1	27.1	32.5
Purdue Selection	6562	3.0	7.4	17.9	26.6	34.5	45.5	12.6	49.9	42.0	26.6	32.5
Purdue Selection	7067	2.9	11.7	22.6	37.1	54.1	60.5	21.2	50.6	36.1	33.0	32.5
Purdue 21	4581	2.1	11.4	16.7	26.6	41.8	56.8	16.5	50.6	27.0	27.7	32.5
Beecher (Spring sown)	6566	3.2	10.4	15.5	55.8	32.8	67.8	28.9	.....	24.1	29.8	28.9
Jackson	6569	4.1	10.0	13.5	29.5	52.1	69.5	26.6	59.0	.....	33.0	32.2
Kirwin	7075	1.3	6.0	21.7	28.9	52.4	67.0	14.2	61.0	.....	31.6	32.2
Trebi (Fall sown)	936	1.3	4.5	1.2	4.2	.....	39.9	0.0	55.0	.....	15.2	29.0
Dicktoo	5529	1.8	4.1	29.2	69.5	38.8	46.4	.....	.....	.....	31.6	30.0
Meimi	5136	3.0	7.9	31.0	27.2	50.4	46.1	.....	.....	.....	27.6	30.0
Kearney	7580	3.0	6.6	.....	.....	.....	.....	.....	.....	.....	4.8	5.6
Reno	6561	.....	.....	.....	11.4	47.0	55.2	18.8	54.4	31.2	36.3	43.5
Wintex	6127	.....	.....	.....	.....	46.0	53.2	8.8	62.6	.....	42.6	49.2
L. S. D. 5%		1.1	No. Sig.	5.2	13.7	.....	18.3	.....	9.3	7.2	.....	.....

Table 4.—Summarized Yields of Winter Barley Varieties Grown at Fort Collins, Colorado, for Varying Periods of Years from 1944 to 1953, inclusive.

Variety	C.I. No.	YEARS GROWN									Average	Pueblo Same Years
		1953	1951	1950	1949	1948	1947	1946	1945	1944		
Yield in Bushels per Acre												
Pueblo	8070	69.1	97.6	48.1	80.9	58.2	48.8	44.1	49.0	59.0	61.6	61.6
Ward	6007	36.8	78.8	25.2	70.4	50.5	35.5	27.1	38.1	44.1	45.2	61.6
Purdue Selection	6562	77.4	81.6	32.5	74.8	66.5	51.0	40.9	50.9	53.8	58.8	61.6
Purdue Selection	7067	69.9	95.0	20.8	88.5	64.6	51.6	43.6	55.9	41.6	59.0	61.6
Purdue 21	4581	39.1	76.6	38.5	67.6	54.0	50.8	43.4	36.5	40.9	49.7	61.6
Trebi (Fall sown)	936	51.9	82.0	0.0	0.0	77.1	58.5	0.0	36.6	53.6	40.0	61.6
Jackson	6569	70.9	102.5	28.2	77.6	66.5	57.0	12.8	42.5	.....	57.2	62.0
Kirwin	7075	35.1	81.8	34.1	66.0	58.1	47.4	51.0	43.6	.....	52.1	62.0
Dicktoo	5529	61.4	75.1	47.5	47.2	51.0	34.1	.....	.....	.....	52.7	67.1
Meimi	5136	67.6	87.4	26.1	66.4	74.1	39.0	.....	.....	.....	60.1	67.1
Kearney	7580	77.2	87.2	.....	.....	.....	.....	.....	.....	.....	82.2	83.4
Reno	6561	.....	.....	.....	75.5	60.1	42.2	19.6	35.5	42.0	45.8	56.7
Wintex	6127	.....	.....	.....	.....	63.2	48.4	0.0	44.2	.....	39.0	50.0
L.S.D. 5%		25.9	12.5	.....	16.6	12.2	13.1	.....	10.9	18.2	.....	.....

Table 5.—Yield of Winter Barley Varieties Grown in County Tests in Various Years from 1947 to 1952, inclusive.

Variety	COUNTIES IN WHICH TESTS ARE LOCATED						Total	Ave. Yrs. Tested	Ave. Yield Same Period
	1947 Mesa	1948 Adams	1948 Mesa	1949 Kit Carson	1949 Prowers	1952 Kit Carson			
Yield in Bushels per Acre									
Pueblo	.....	40.4	64.6	37.9	66.9	4.8	214.6	42.9	45.1
Ward	46.1	43.0	57.9	*52.0	68.5	4.0	271.5	45.2	45.2
Purdue	.....	37.9	52.6	*28.4	60.2	.....	179.1	44.8	55.3
Reno	43.1	42.1	61.9	35.8	62.2	.....	245.1	49.0	53.5
Kirwin	27.5	*30.0	48.6	41.6	56.5	.....	204.2	40.8	53.5
Tenn. winter	24.9	.....	.....	.....	.....	.....	24.9	24.9	46.1
Wisc. winter	30.0	.....	.....	.....	.....	.....	30.0	30.0	46.1
Kearney	.....	.....	.....	.....	.....	6.2	6.2	6.2	4.0
Meimi	.....	.....	.....	.....	.....	4.0	4.0	4.0	4.0
Dicktoo	.....	.....	.....	.....	.....	4.7	4.7	4.7	4.0
	N.S.	L.S.D. 5%	N.S.	L.S.D. 5%	N.S.	N.S.			
		8.8		12.6					

Winter barley planted in 1950, 1951, and 1952 was nearly a failure, with too thin stands generally to make yield determinations. However, observations of winter hardiness or spring stands compared with fall stands indicated Kearney, Dicktoo, and Meimi all had greater spring emergence than Ward or Pueblo.

*Significant differences

Table 6.—Weight per Measured Bushel in Pounds for Winter Barley Varieties Grown on the U. S. Dry Land Field Station, Akron, Colorado, for Varying Periods of Years from 1944 to 1952, inclusive.

Variety	C.I. No.	YEARS GROWN								Average	Pueblo Same Years
		1952	1950	1949	1948	1947	1946	1945	1944		
Pounds per Measured Bushel											
Pueblo	8070	32.0	38.0	41.0	44.0	47.0	39.0	45.0	36.0	40.3	40.3
Ward	6007	34.0	41.0	42.0	43.0	47.0	41.0	43.0	39.5	41.3	40.3
Purdue Selection	6562	34.0	43.0	47.0	41.0	48.0	45.0	46.0	43.0	43.4	40.3
Purdue Selection	7067	35.0	43.0	47.0	45.0	48.0	46.0	46.0	43.0	44.1	40.3
Purdue 21	4581	32.0	40.0	44.0	44.0	47.0	38.0	40.0	42.0	40.9	40.3
Beecher (Spring sown)	6566	31.0	36.0	46.0	45.0	48.0	41.0	.....	36.0	40.6	39.6
Jackson	6569	32.0	41.0	48.0	43.0	47.0	41.0	43.0	.....	42.1	40.9
Kirwin	7075	34.0	39.0	45.0	46.0	46.0	40.0	41.0	.....	41.6	40.9
Trebi (Fall sown)	936	37.0	.....	39.0	.....	45.0	.....	43.0	.....	41.0	41.0
Dicktoo	5529	31.0	40.0	48.0	46.0	47.0	.....	.....	.....	42.4	40.4
Meimi	5136	37.0	41.0	44.0	46.0	47.0	.....	.....	.....	43.0	40.4
Kearney	7580	34.0	.....	.....	.....	.....	.....	.....	.....	34.0	32.0
Reno	6561	.....	.....	41.0	45.0	47.0	36.0	45.0	42.5	42.8	43.1
Wintex	6127	.....	.....	.....	44.0	47.0	42.0	45.0	.....	44.5	43.8

Table 7.—Weight per Measured Bushel of Winter Barley Varieties Grown at Fort Collins for Varying Periods of Years from 1944 to 1953, inclusive.

Variety	C.I. No.	YEARS GROWN									Average	Pueblo Same Years
		1953	1951	1950	1949	1948	1947	1946	1945	1944		
Pounds per Measured Bushel												
Pueblo	8070	53.6	50.4	50.2	50.7	47.5	45.6	50.2	42.5	46.0	48.5	48.5
Ward	6007	51.1	47.2	49.0	49.6	44.2	42.6	53.5	38.3	41.1	46.3	48.5
Purdue Selection	6562	53.4	51.4	51.6	51.0	48.2	46.8	52.5	45.3	47.8	49.8	48.5
Purdue Selection	7067	52.9	51.0	48.7	49.2	45.7	47.0	53.2	43.8	41.9	48.2	48.5
Purdue 21	4581	51.3	46.0	49.0	50.2	45.0	42.0	49.2	40.0	39.3	45.8	48.5
Jackson	6569	52.4	49.2	49.2	50.4	46.0	47.5	53.5	41.2	.....	48.7	48.8
Kirwin	7075	51.6	47.3	49.2	48.8	46.9	46.2	51.4	42.2	.....	48.0	48.8
Trebi (Fall sown)	936	49.4	48.9	.....	.....	44.2	44.7	.....	41.8	40.7	45.0	47.6
Dicktoo	5529	51.1	51.1	49.7	46.9	42.4	45.3	.....	.....	.....	47.8	49.7
Meimi	5136	53.0	52.9	50.2	49.8	48.3	50.4	.....	.....	.....	50.8	49.7
Kearney	7580	52.4	51.2	.....	.....	.....	.....	.....	.....	.....	51.8	52.0
Reno	6561	.....	.....	.....	49.9	45.5	42.3	51.5	38.7	43.2	45.2	47.1
Wintex	6127	.....	.....	.....	.....	45.6	41.2	.....	42.7	.....	43.2	45.2