UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF PLANT INDUSTRY

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COMPARISON OF WINTER WHEAT VARIETIES GROWN IN COOPERATIVE PLOT AND NURSERY EXPERIMENTS IN THE HARD RED WINTER WHEAT REGION IN 1938

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Lincoln, Nebraska
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COMPARISON OF WINTER WHEAT VARIETIES GROWN IN COOPERATIVE PLOT AND NURSERY EXPERIMENTS IN THE HARD RED WINTER WHEAT REGION IN 1938

by

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1/ The writer wishes to express his appreciation to Ronald W. Carpenter and Albert H. Moseman, Agents, of Lincoln, Nebr., for their assistance in assembling the data and making all computations in this summary.

EXPERIMENTS IN 1938

The cooperative winter wheat improvement program has been in operation for eight years. During this time no radical changes of plans have occurred although each year changes are made in the lists of varieties tested in plot and nursery experiments. The cooperating stations have changed slightly from time to time due to reorganization of State and Federal work.

In 1938 a Regional Hard Red Winter Wheat Quality Laboratory was established at Manhattan, Kans., in cooperation with the Kansas Agricultural Experiment Station. The function of this laboratory will be to study problems relating to the measurement of quality of hard red winter wheats as well as to test the milling and baking characteristics of wheat varieties grown in the cooperative improvement program.

This report is a summary of the 1938 data from all cooperating stations as well as a summary of yield data for the 8-year period ending in 1938. The cooperating agencies, stations, and personnel concerned in these experiments are as follows:

COOPERATING AGENCIES, STATIONS, AND PERSONNEL
(The asterisk (*) indicates Government field stations)

BUREAU OF PLANT INDUSTRY:		
Division of Cereal Crops and Diseases		M. A. McCall
Wheat Investigations		S. C. Salmon
Hard Red Winter Wheat		K. S. Quisenberry
Smut		H. A. Rodenhiser
Leaf Rust		C. O. Johnston
Milling and Baking		C. C. Fifield, M. A. Barmore, M. E. McCluggage, K. F. Finney
TEXAS AGRICULTURAL EXPERIMENT STATION:		
Agronomy (Corn and Small Grains)		P. C. Mangelsdorf
College Station	Agricultural Exp. Station	E. S. McFadden
Denton	Substation No. 6	I. M. Atkins
Chillicothe	Substation No. 12	J. R. Quinby, I. M. Atkins
Amarillo		I. M. Atkins
Bushland		I. M. Atkins
OKLAHOMA AGRICULTURAL EXPERIMENT STATION:		
Field Crops and Soils		H. J. Harper
*Lawton	U. S. Dry Land Field Station 1/	W. M. Osborn
Stillwater	A. and M. College	C. B. Cross
*Woodward	Southern Great Plains Field Sta. 1/	V. C. Hubbard
Goodwell	Panhandle Agr. Exp. Sta.	Ernest Mader
KANSAS AGRICULTURAL EXPERIMENT STATION:		
Agronomy		R. I. Throckmorton
Manhattan	Kansas State College	J. H. Parker, H. H. Laude, E. G. Heyne
Hays	Ft. Hays Branch Exp. Sta.	A. F. Swanson
Colby	Colby Branch Station	E. H. Coles
COLORADO AGRICULTURAL EXPERIMENT STATION:		
Agronomy		Alvin Kezer
*Akron	U. S. Dry Land Field Sta. 1/	J. J. Curtis
Fort Collins	State Agricultural College	D. W. Robertson
NEBRASKA AGRICULTURAL EXPERIMENT STATION:		
Agronomy (Experimental)		T. A. Kiesselbach
Lincoln	Agricultural Exp. Sta.	K. S. Quisenberry
North Platte	North Platte Substation	O. J. Webster, L. L. Zook
Alliance	Box Butte Experiment Farm	George Schmid
Valentine	Valentine Substation	E. M. Brouse
WYOMING AGRICULTURAL EXPERIMENT STATION		
*Sheridan	U. S. Dry Land Field Sta. 1/	R. S. Towle
MINNESOTA AGRICULTURAL EXPERIMENT STATION:		
Agronomy and Plant Genetics		H. K. Hayes
St. Paul	University Farm	E. R. Ausemus
Waseca	Southeast Exp. Sta.	R. E. Hodgson
Grand Rapids		E. R. Ausemus
NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION:		
Agronomy		T. E. Stoa
Dickinson	Dickinson Substation	R. W. Smith
MONTANA AGRICULTURAL EXPERIMENT STATION:		
Agronomy		A. H. Post
Bozeman	Montana Exp. Sta.	R. H. Bamberg
Moccasin	Judith Basin Branch Sta.	R. H. Bamberg, S. Litzenberger
Havre	Northern Mont. Branch Sta.	J. J. Sturm

1/ Cooperation with Division of Dry Land Agriculture, Bureau of Plant Industry, as well as with the State experiment stations.

UNIFORM VARIETIES IN PLOTS

Because of the wide variation in environment encountered in the region from Texas to Montana, it has not seemed advisable to seed the same varieties at all stations. The region has been divided into three districts, as shown by the map on the following page, and the varieties grown uniformly at the cooperating experiment stations are somewhat different in each of the three districts. The varieties considered as uniform for each district in 1938 are as follows:

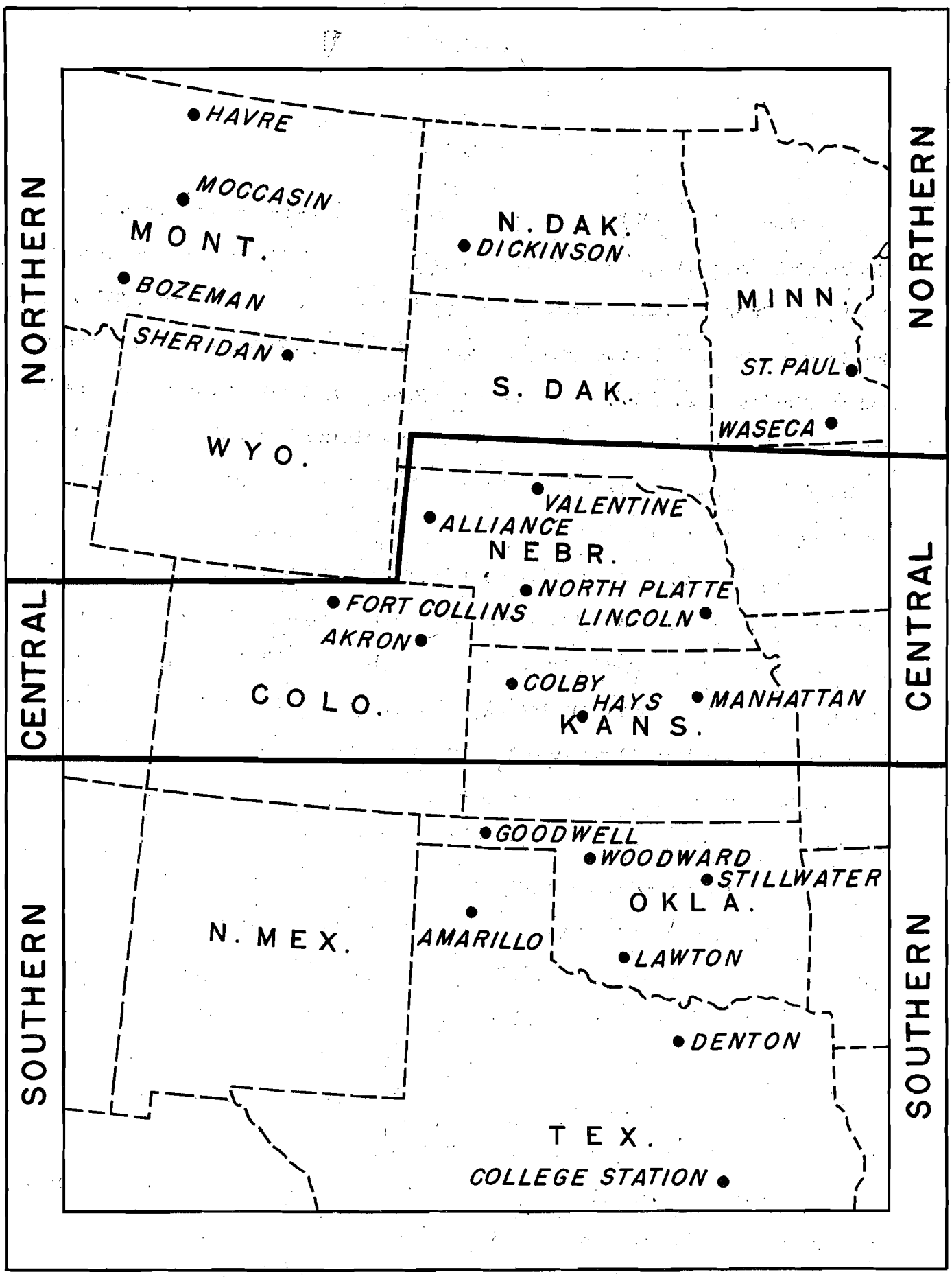
Southern		Central		Northern	
Variety		Variety		Variety	
Hard Red:	C.I.No. 1/	Hard Red:	C.I.No. 1/	Hard Red:	C.I.No. 1/
Kharkof	1442	Kharkof	1442	Kharkof	1442
Tenmarq	6936	Tenmarq	6936	Minturki	6155
Blackhull	6251	Blackhull	6251	Yogo	8033
Quivira	8886	Oro	8220	Karmont	6700
Early Blackhull	8856	Cheyenne	8885	Minturki x Marquis	11502
Chiefkan	11754	Chiefkan	11754	Minard x Minhardi	8888
Oro x Tenmarq	11673	Oro x Tenmarq	11673	Nebred	10094
Kawvale x Tenmarq	11669	Kawvale x Tenmarq	11669		
		Nebred	10094		
		Kanred	5146		
Soft Red:					
Denton	8265				
Kawvale	8180				

1/ C. I. refers to accession number of the Division of Cereal Crops and Diseases, formerly Office of Cereal Investigations.

The lists include the most widely grown commercial varieties of the region (considering Kharkof as representing the Turkey type) and some of the more promising new varieties and strains.

At all of the experiment stations, varieties of local interest, in addition to those in the uniform list were grown. The data for all varieties reported as grown in replicated plots at each station are included in this report.

In August 1938, the Nebraska Agricultural Experiment Station decided to name Turkey selection, Nebraska No. 1063 (C.I.10094), Nebred and to release the variety to Nebraska farmers. In this report the name Nebred will be used in place of Turkey selection, but should cause no confusion since the C. I. number remains the same as in previous years.


NORTHERN
CENTRAL
SOUTHERN
HAVRE
MOCCASIN
MONT.
BOZEMAN
SHERIDAN
WYO.
N. DAK.
DICKINSON
MINN.
ST. PAUL
S. DAK.
WASECA
VALENTINE
ALLIANCE
NEBR.
NORTH PLATTE
FORT COLLINS
LINCOLN
AKRON
COLO.
COLBY
HAYS
MANHATTAN
KANS.
GOODWELL
WOODWARD
STILLWATER
OKLA.
N. MEX.
AMARILLO
LAWTON
DENTON
TEX.
COLLEGE STATION

PLOT DATA

In the fall of 1937 plots were seeded at 24 cooperating stations. The stations reporting data for the first time are Chillicothe and Bushland, Texas, and Grand Rapids, Minn. Complete failures occurred at Lawton, Okla., due to a severe hail storm early in May; at Goodwell, Okla., because of drought; and at Dickinson, N. Dak., because of grasshoppers. Yield and other agronomic data for the varieties grown at each of the remaining 21 stations are given in table 1. The generalized standard errors for most of the stations are given and are summarized in table 2.

To save space, data are given only for those characters that showed a contrasting reaction and that may have had an influence on yield. For each station the varieties are listed in order of yield for 1938 and, where possible, average yields are given for the eight years (1931-38) or shorter periods. Where varieties have been grown for varying periods a percentage of Kharkof (C. I. 1442) is shown so that comparisons may be made more easily. For the most part the data need little explanation.

In the southern and northern districts fall moisture conditions were fairly good, allowing the crop to make a good start, except in some areas of Oklahoma where grubs caused considerable damage to the new crop. In the central district seedbeds were dry, causing late seeding and late germination. Where the wheat did germinate and emerge early, grasshoppers caused some damage in certain areas in Nebraska. A quick freeze the middle of November gave the small plants a severe shock from which they did not recover completely before winter set in. This freeze was severe enough to cause complete killing of winter barley from central Kansas north.

For the most part the winter was not severe and the spring was early and there was considerable moisture. This caused the plants to grow rapidly and stool very freely, especially in the central and southern districts. In the central district there was never an excessive amount of moisture present, rains coming just often enough to keep the plants in a good growing condition. A severe freeze in early April caused some damage in Oklahoma and Texas and another freeze in early May caused sterility in some of the varieties at Hays, Kans. Owing to rapid growth in the spring an early harvest was indicated, but cool weather in May and early June delayed maturity until about the average date.

Leaf rust was reported early at all stations from Texas north to Nebraska and very rapidly developed into one of the worst epidemics ever known. In some cases varieties failed to head normally because of the heavy leaf rust infection. Stem rust started early at Denton but did not move north as rapidly as expected, although late wheat farther north was damaged. The stem rust seemed to move north farther west than is usually the case.

As harvest started in Texas and southern Oklahoma it was discovered that yields would not be as high as had been expected. In some cases heads were partly sterile and much lodging was present. Just what was the cause of this lodging and straw breaking is not known but was the subject of many discussions. Undoubtedly a number of factors contributed to this so-called "rotten straw," some of these being spring freezes, leaf rust, foot rot, heat, high winds, beating rains, and possibly Septoria nodorum. Hail damage was more serious than usual in 1938, being particularly severe in southwestern Oklahoma and in certain sections of Kansas. In isolated areas grasshoppers caused considerable damage by chewing the necks, thus causing the heads to fall down. Where wheat stood a little too long after it was ripe the crop was extremely difficult to harvest due to lodging and straw breaking. In central Nebraska shortly before harvest drought became a factor because the heavy straw

growth had used all of the moisture and the quality of grain was very poor.

Yields generally were below predictions and in the central and southern districts test weights were low and the color of the grain was poor. Yields of 10 to 15 bushels per acre with tests of 45 to 50 pounds per bushel were reported frequently. In these two districts it was difficult to obtain suitable material for milling tests of the different varieties. In the northern district yields and quality were much better than in previous years.

The general statements given above summarize very briefly a most unusual season. For a more complete discussion the reader is referred to the Cereal Courier, Vol. 30, No. 13, August 25, 1938. Never in the experience of the writer has there been so much interest in the winter wheat crop. More crop observers were in the field than ever before and predictions were issued freely, most of w hich proved to be wrong.

At Denton leaf and stem rust infections were very heavy, especially on the later varieties and undoubtedly influenced the final yield and quality. One or two varieties were apparently early enough in maturity to escape damage from stem rust. Except for Early Blackhull all test weights were less than 60 pounds per bushel. Oro x Tenmarq (C. I. 11673) and Kawvale x Tenmarq (C. I. 11669), two new early wheats, gave the highest yields, while the later varieties such as Fulcaster, Kanred, and Kharkof gave the lowest average yields. For the 8-year average Quivira, Tenmarq, and Kawvale rank highest, while for the average of the last four years Early Blackhull ranks second to Quivira. All of the soft red winters average lower in yield than the best hard red winters.

Yields were reported from Chillicothe, Texas, for the first time. At this station a rather heavy epidemic of leaf rust developed on susceptible varieties. There was also some shattering, particularly in Kawvale x Tenmarq (C. I. 11669). Test weights were low and yields ranged from 9.4 bushels per acre for Early Blackhull to 22.6 bushels per acre for Chiefkan. The varieties Tenmarq, Blackhull, and Kawvale x Tenmarq (C. I. 11669) also gave good yields. In spite of its leaf rust resistance Kawvale yielded only 15.1 bushels per acre and had a test weight of 52 pounds per bushel.

At Amarillo yields were fairly good for this station, all of them being above 20 bushels per acre. Here Kharkof, Chiefkan, and Denton gave the highest yields with Quivira and Early Blackhull ranking the lowest. On the basis of the average only one variety has outyielded Kharkof and this is Chiefkan which has been grown for two years only. Based on either the 4-year or the 2-year period none of the varieties is particularly outstanding for yield. More data must be obtained before any definite recommendations can be made for this area.

A variety test was grown for the first time on the Soil Conservation Service Field Station at Bushland, Texas, which is 13 miles west of Amarillo. Tenmarq and Kharkof gave the highest average yields and Chiefkan and Quivira the lowest. The behavior of Quivira was in agreement with its performance at Amarillo but Chiefkan did not perform as well as it did at Amarillo. Early Blackhull was included in this test but due to an error in harvesting it was necessary to discard the yield.

Sibley No. 81, Quivira, and Kawvale gave the highest average yields at Stillwater, while Turkey, Blackhull, and Early Blackhull gave the lowest. For the 8-year average Denton, Sibley No. 81, and Sibley No. 62 have the highest average yields. The last two varieties are wheats selected and developed at Stillwater. For the 3-year average (1936-38) Clarkan, a soft wheat, has the highest average yield, followed by Sibley No. 81, Quivira, and Kawvale. At this station soft wheats seem to yield better in comparison to hard wheats than they do at Denton.

At Woodward yields were unusually high in spite of a heavy leaf rust infection and considerable lodging. Blackhull and Early Blackhull lodged very badly, a condition that was generally true of these varieties on farms during the past season. Kawvale x Tenmarq (C. I. 11669), Tenmarq x Nebraska No. 28 (C. I. 11847), and Kawvale gave the highest average yields. Two of these wheats carry resistance to leaf rust. The two soft wheats, Denton and Fulcaster, and the two Blackhulls gave the lowest average yields. For a 7-year period Tenmarq, Quivira, Kharkof, and Cheyenne ranked the highest for yield. From this it might seem that early wheats have a slight advantage for this section of Oklahoma.

A very complete set of data were obtained at Manhattan, Kans., since at this station the varieties are studied in more detail than at any other cooperating station. Rather severe epidemics of both leaf and stem rust developed and there was considerable lodging, particularly in the Blackhull wheats including Chiefkan. Test weights were all very low, especially the later va rieties. Even Blackhull and Chiefkan failed to produce wheat weighing 60 pounds per bushel. Yields were much lower than normal, ranging from 10.3 bushels per acre for Harvest Queen to 27.2 bushels per acre for Kawvale x Tenmarq (C. I. 11669). Yielding the highest at this station were four new Kawvale x Tenmarq strains. Following these strains were two Oro x Tenmarq selections. All of these wheats are early and have some resistance to leaf and stem rust. The later varieties, such as Kanred, Cheyenne, Nebred, and Kharkof, yielded only about half as much as the newer hybrids. For the 8-year period (1931-38) Kawvale, Quivira, Cheyenne, and Clarkan have the highest average yields, while for the last two years Kawvale x Tenmarq (C. I. 11669), Kawvale x Tenmarq (C. I. 11750), and Oro x Tenmarq (C. I. 11673) rank highest.

At Hays, Kans., leaf rust developed rather heavily on all varieties not carrying some resistance, only Kawvale x Tenmarq (C. I. 11669) being free from infection. Stem rust was rather heavy, particularly on the later Turkey types of wheat. As mentioned before, the freeze of early May caused some injury to the plants, particularly in the case of Tenmarq, Kawvale x Tenmarq (C.I.11669), and Oro x Tenmarq (C. I. 11673). The early wheats seemed to have been injured more than the later ones. Test weights were very good in spite of the heavy rust infection and yields ranged from 16.5 to 42.0 bushels per acre. Kawvale x Tenmarq (C. I. 11669) gave the highest average yield, followed by Quivira, Chiefkan, and Kanred x Marquis (C. I. 11589). At the bottom of the list will be found Oro, Nebraska No. 60, and a Blackhull hybrid.

For the long-time average Quivira has the highest yield, followed by Tenmarq, Blackhull, and Cheyenne. For the last three years Quivira has the highest average yield, followed by Chiefkan, Kanred x Marquis (C. I. 11589), and Tenmarq. It is of interest that the so-called early, less winter hardy wheats continue to give the higher yields at this station.

Yields were obtained at Colby, Kans., for the first time since 1934. Test weights were unusually good at this station, all varieties weighing 60 pounds or more per bushel. Yields were rather low with Chiefkan, Blackhull, and Kanred at the top of the list and Cheyenne, Oro, and Nebred at the bottom. Based on the 4-year average Blackhull, Cheyenne, and Oro are the outstanding varieties.

There was some winter-killing of the varieties in plots at Akron although the range of damage was not great. Some stem rust and considerable leaf rust developed, particularly on the later varieties such as Yogo and Oro. Lodging or straw breaking was reported in Blackhull and Chiefkan. The highest-yielding varieties were Kawvale x Tenmarq (C. I. 11669), Nebred, and Akron No. 7. The lower-yielding varieties were Kanred, Oro, Chiefkan, and Alton. The two low-yielding varieties are both beardless. For the 8-year period (1931-38) Blackhull, Early Blackhull, Tenmarq, and Cheyenne continue to rank the highest. For the 3-year period (1936-38) Nebred, Akron No. 7, and Turkey x Marquis (C. I. 11747) have the highest average yields.

Considerable winter-killing occurred in the more tender varieties at Lincoln. Because of the lack of sufficient moisture to mature a normal crop these varieties having thin stands ranked higher for yield than ordinarily would have been expected. A heavy leaf rust epidemic developed early in the season and did considerable damage, with only a few varieties showing any amount of resistance. Considerable lodging or straw breaking appeared in the plots just before harvest, the result of a combination of weakened straw and high winds. Strains related to Blackhull seemed to have the most brittle straw and broke over the worst, although some Turkeys were bad. Whether this lodging was caused by leaf rust, Septoria, or some other factor or combination of factors was not established. Test weights were all less than 60 pounds per bushel, the grain was very dull in color, and yields were again lower than the average. Chiefkan, Kawvale x Tenmarq (C. I. 11669), Oro x Tenmarq (C. I. 11673), and Nebred gave the highest yields. For the 8-year period Cheyenne continues to rank first, followed by Kawvale, Turkey (S. D. No. 144), and Nebred. For the 3-year period (1936-38) Kawvale x Tenmarq (C. I. 11669), Nebred, and Kanred have the highest average yields.

The varieties were grown on both fallow and corn ground at North Platte, Nebr. Straw growth was entirely too heavy for the available moisture, and this caused low test weights and low yields. The highest average yields were produced by Kawvale x Tenmarq (C. I. 11669), Chiefkan, and Cheyenne. For the 7-year period Cheyenne has the highest average yield, followed by Tenmarq and Local Turkey.

A crop of winter wheat was harvested at Alliance, Nebr., for the first time since 1933. There was some winter-killing at this station but no variety was seriously injured. Considerable leaf rust developed on all varieties that had no resistance. Test weights were very good and yields ranged from 18.6 to 23.3 bushels per acre. Cheyenne gave the highest yield, followed by Kawvale x Tenmarq (C. I. 11669), Turkey selection (C. I. 10016), and Cheyenne selection (C. I. 11666). Kharkof and Yogo were the lowest-yielding varieties. On the basis of a 3-year average, Turkey selection (C. I. 10016), Cheyenne, and Nebraska No. 60 have the best yields, although no variety is particularly outstanding at this station, based on the three crops harvested since 1931.

Yields were reported from Valentine, Nebr., for the first time since 1931, and since the list of varieties is not complete the data are not included in the averages. Test weights were unusually good but yields were very low. Turkey selection (C. I. 10015), Chiefkan, and Quivira gave the highest average yields. For the 2-year average (1931 and 1938) Kharkof, Quivira, and Blackhull rank the highest.

All varieties except Nebred survived the winter at Waseca very well. Both leaf and stem rust developed and there was considerable lodging in most varieties. The highest yield as made by one of the new, winter hardy hybrids, Minhardi x Marquis (C. I. 11657), produced at St. Paul. Nebred ranked second, followed by Minturki x Marquis (Minn. 2552), and Minturki x Marquis (C.I.11502) Over a period of six years Minturki has given the highest average yield, followed by Yogo. For the last two years Minhardi x Marquis (C. I. 11657) has given the highest average yield, followed by Nebred and Minturki x Marquis (Minn. No. 2552).

Winter-killing was very severe at St. Paul and survivals ranged from 20 to 87 percent. Both leaf and stem rust were present and there was consicerable lodging. Test weights and yields of the later, rust-susceptible wheats were very low. Minturki and Minard x Minhardi (C. I. 8888) gave the highest average yields, while Minard and Minhardi were practically ruined by rust and gave very low yields and very low test weights.

At Grand Rapids, Minn., leaf and stem rust developed rather heavily on all of the varieties included in the test. In spite of the rust test weights ranged from 54 to 57.5 pounds per bushel and yields were fairly good. Minhardi x Marquis (C. I. 11657) and Yogo gave the highest average yields at this station. This is the first year that winter wheat yields have been reported from Grand Rapids.

All varieties survived the winter in good shape at Sheridan, Wyoming, and an unusually good crop was harvested. Test weights were all 60 or 61 pounds per bushel and the lowest-yielding variety gave a yield of 40 bushels per acre. Nebraska No. 60, Montana No. 36, and Nebred had the highest average yields. For an 8-year period Montana No. 36 ranks first for yield, followed by Kanred and Yogo. Although grown for only a 4-year period, Cheyenne has given the highest yield of any variety at this station as expressed in percentages of Kharkof.

Lodging was severe at Bozeman as is usually the case. Yogo, Yogo selection, Oro, and Karmont lodged the worst, with Minard x Minhardi (C. I. 8888) standing up the best. Test weights were all above 60 pounds per bushel. Yields ranged from 47.3 to 68.2 bushels, slightly lower than in previous years. Cheyenne, Minturki, and Yogo had the highest average yields. During the 7-year period Yogo, Nebraska No. 60, and Kharkof have the best yields. For the last two years Cheyenne, Nebred, and Minard x Minhardi (C. I. 8889) have the highest average yields. Although grown for only three and five years, respectively, Nebred and Cheyenne have the best yield records of any variety when expressed in percentage of Kharkof.

No winter-killing was observed at Moccasin, Mont., and sufficient moisture was present to produce a fairly good crop. Test weights were all above 60 pounds per bushel and quality of the grain was unusually good. The highest yields were made by Karmont, Turkey x Kanred (C. I. 11725), and Yogo. The lower-yielding varieties were Cheyenne, Minard x Minhardi (C. I. 8888), Nebred, and a new selection of Minessa x Beloglina-Buffum. For a 7-year period Eureka x Minhardi (C. I. 8036), Turkey x Minessa (C. I. 8887), and Yogo have given the highest average yields. For the last two years Turkey x Kanred (C. I. 11725), Yogo, and Turkey x Minessa (C. I. 8887) have ranked highest. During this same period Nebred has given the lowest average yield.

Test weights were unusually good at Havre and yields ranged from 11.7 to 21.4 bushels per acre. Karmont, Yogo, and Minhardi x Minturki (C.I.8034) were highest in yield with Turkey selection (C. I. 10016) and Nebred lowest. The yields of these two wheats were very much lower than the rest of the varieties in the test. Based on a 6-year average, Yogo has the best record followed by Minturki, Karmont, and Turkey x Minessa (C. I. 8028).

Table 1.- Agronomic and other data for winter wheat varieties grown in replicated plots in cooperative experiments at 21 experiment stations in the hard red winter wheat area in 1938, and average yields for 1931-38

Denton, Texas

(Four 1/44th-acre plots)

Variety	C. I. No.	Date Headed	Date Ripe	Hgt.	Rust Leaf	Rust Stem	Test wt. (per bu.)	Av. acre yield	Yield Av. 1931-1938	Rank	Yield Av. 1934-1938	Rank	No. of yrs. grown	Percentage of Kharkof for same years
				(In.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)	(Bu.)		(Bu.)			
Oro x Tenmarq	11673	Apr. 24	May 29	41	29	25	58	29.1	----		----		1	253.0
Kawvale x Tenmarq	11669	Apr. 25	May 29	38	13	6	59	28.8	----		----		1	250.4
Early Blackhull	8856	Apr. 12	May 23	40	65	1	61	28.2	----		30.6	2	6	122.1
Kawvale x Tenmarq	11953	Apr. 29	May 30	39	25	13	56	26.0	----		----		1	226.1
Chiefkan	11754	Apr. 28	June 1	43	43	19	58	25.2	----		----		1	219.1
Clarkan	8858	Apr. 30	May 31	46	48	58	54	23.5	----		27.8	4	5	124.1
Martin x Tenmarq[3]	11805	Apr. 28	June 1	40	33	41	53	23.4	----		----		1	203.5
Quivira	8886	Apr. 25	May 29	39	29	15	54	22.5	32.7	1	30.7	1	8	134.6
Denton x Kanred (T.S. 4-33-28)	------	May 2	June 1	41	56	51	53	22.1	----		----		1	192.2
Tenmarq	6936	Apr. 29	May 31	42	54	44	52	21.9	31.7	2	29.5	3	8	130.5
Mediterranean Campbell (T.S. 2350)	------	Apr. 27	May 29	42	58	77	56	21.6	----		----		2	139.6
Kawvale	8180	Apr. 29	May 31	41	20	30	55	21.5	29.5	3	27.1	6	8	121.4
Blackhull	6251	May 1	June 2	39	95	23	56	20.1	27.3	6	26.8	7	8	112.3
Mediterranean selection	11526	Apr. 24	May 28	37	29	2	56	20.1	----		----		6	115.6
Martin x Tenmarq[3]	11804	Apr. 29	June 9	39	28	56	51	19.9	----		----		1	173.0
Mediterranean selection	10086	Apr. 27	May 29	39	28	33	56	19.9	25.6	8	23.0	11	8	105.3
Denton	8265	Apr. 29	June 1	45	21	58	54	19.8	27.7	5	24.1	8	8	114.0
Fulcaster	6471	Apr. 29	May 30	41	93	69	53	18.7	25.9	7	23.4	9	8	106.6
Kanred	5146	May 1	June 2	39	95	26	52	18.4	29.0	4	27.3	5	8	119.3
Mediterranean selection	11525	Apr. 27	May 29	42	11	58	57	18.3	----		23.1	10	7	109.2
Kharkof	1442	May 4	June 5	36	93	68	48	11.5	24.3	9	22.4	12	8	100.0

Standard error of a difference, 1.83 bu.; standard error of a mean, 1.29 bu., or 5.89 percent.

Table 1. - (Continued)

Chillicothe, Texas

(Four plots; Seeded Nov. 19, 1937)

Variety	C. I. No.	Date Headed	Date Ripe	Height (In.)	Leaf rust (Pct.)	Shattering (Pct.)	Test wt. (per bu.) (Lbs.)	Av. acre yield (Bu.)
Chiefkan	11754	May 1	June 1	28	20	T	58	22.6
Tenmarq	6936	May 1	May 30	23	20	T	57	21.0
Blackhull	6251	May 1	June 2	24	25	T	57	20.5
Kawvale x Tenmarq	11669	Apr. 22	May 30	26	T	5	56	20.3
Cheyenne	8885	May 1	May 30	20	35	T	57	19.3
Quivira	8886	Apr. 22	May 28	23	10	1	53	19.1
Martin x Tenmarq[3]	-----	May 1	May 30	26	15	T	57	**19.0**
Kanred	5146	May 1	May 30	27	30	T	57	18.7
Kharkof	1442	May 3	June 3	24	30	T	56	18.3
Turkey Vaughn	-----	May 1	May 30	22	30	T	56	18.2
Mediterranean	3332	May 1	May 30	25	T	1	57	17.9
Denton	8265	May 1	June 2	25	T	1	57	17.9
Turkey	1558	May 1	May 30	23	30	T	56	17.2
Oro x Tenmarq	11673	Apr. 22	May 30	23	10	2	56	16.6
Kawvale	8180	May 1	June 2	25	T	1	52	15.1
Early Blackhull	8856	Apr. 12	May 30	22	15	T	54	9.4

Standard error of a difference, 1.57 bu., standard error of a mean, 1.11 bu., or 6.10 percent.

Table 1. -(Continued)

Amarillo, Texas

(Two plots)

Variety	C. I. No.	Test weight (per bu.)	Av. acre yield	Yield: Av. 1931, 1934, and 1937-38	Rank	Yield: Average for 1937-38	Rank	No. of years grown	Percentage of Kharkof for same years
		(Lbs.)	(Bu.)	(Bu.)		(Bu.)			
Kharkof	1442	58.5	27.3	18.4	1	23.1	2	4	100.0
Chiefkan	11754	60.5	26.0	-----		23.5	1	2	101.7
Denton	8265	57.0	25.3	16.9	6	21.3	5	4	91.8
Turkey Vaughn	-----	60.0	25.2	-----		21.8	3	3	93.5
Kawvale	8180	55.0	25.2	16.6	7	20.9	7	4	90.2
Cheyenne	8885	60.0	24.6	-----		21.6	4	3	94.0
Kanred	5146	58.0	24.3	17.6	3	20.9	7	4	95.7
Oro x Tenmarq	11673	58.0	24.2	-----		-----		1	88.6
Blackhull	6251	60.0	23.3	17.3	4	20.2	10	4	94.0
Tenmarq	6936	56.5	23.2	17.8	2	20.2	10	4	96.7
Turkey	1558	58.0	22.9	-----		20.7	9	3	92.5
Kawvale x Tenmarq	11669	58.0	22.1	-----		-----		1	81.0
Martin x Tenmarq[3] (T.S.50-33-65)-----		54.0	22.0	-----		-----		1	80.6
Quivira	8886	57.0	21.9	17.2	5	21.2	6	4	93.5
Early Blackhull	8856	59.0	21.2	-----		19.5	12	3	83.0

Bushland, Texas

(Two plots)

Variety	C. I. No.	Test weight (per bu.)	Average acre yield
		(Lbs.)	(Bu.)
Tenmarq	6936	58.0	10.2
Kharkof	1442	58.0	10.0
Turkey	1558	59.0	9.6
Turkey Vaughn	-----	57.0	9.4
Blackhull	6251	59.0	9.4
Cheyenne	8885	59.0	9.4
Kanred	5146	57.0	9.2
Kawvale	8180	57.0	9.2
Denton	8265	58.0	8.7
Chiefkan	11754	59.0	8.5
Quivira	8886	60.0	8.4

Table 1. - (Continued)

Stillwater, Oklahoma

(Four 1/138th-acre plots)

Variety	C. I. No.	Spring survival	Date ripe	Height	Test weight (per bu.)	Av. acre yield	Yield				No. of years grown	Percentage of Kharkof for same years
							Av. 1931-1938	Rank	Av. 1936-1938	Rank		
		(Pct.)	(June)	(In.)	(Lbs.)	(Bu.)	(Bu.)		(Bu.)			
Sibley No. 81	10084	100	10	40	60.7	32.3	29.0	2	27.6	2	8	102.8
Quivira	8886	100	6	38	59.2	32.1	27.7	9	26.7	3	8	98.2
Kawvale	8180	100	10	40	58.2	32.0	28.3	6	26.7	3	8	100.4
Kanred x Hard Federation (III-30-38)	----	100	4	37	59.0	30.8	----		25.4	10	3	97.3
Clarkan	8858	100	11	42	59.3	27.4	----		28.2	1	4	107.8
Denton	8265	100	13	42	58.1	27.2	29.3	1	26.5	5	8	103.9
Kanred	5146	100	11	37	57.6	25.6	27.7	9	25.9	7	8	98.2
Sibley No. 62	11523	100	11	37	57.7	25.6	28.8	3	25.7	9	8	102.1
Tenmarq	6936	97	11	38	57.3	24.9	28.4	5	24.3	13	8	100.7
Kharkof	1442	100	12	37	57.2	24.3	28.2	7	26.1	6	8	100.0
Eagle Chief	8868	95	12	38	58.0	23.7	28.5	4	25.0	12	8	101.1
Turkey selection	10016	100	7	36	58.0	23.5	----		----		4	98.6
Kanred x Hard Federation (III-30-37)	----	100	12	37	55.9	23.4	----		----		1	96.3
Cheyenne	8885	100	11	37	58.0	23.4	28.2	7	25.2	11	8	100.0
Turkey selection (1-27-85)	----	100	13	37	57.2	22.8	----		----		1	93.8
Turkey selection (1-27-94)	----	100	12	38	56.3	22.7	----		----		1	93.4
Kanhull	11877	100	14	41	59.9	22.6	----		----		1	93.0
Turkey selection (1-27-84)	----	100	13	37	56.4	22.2	----		24.0	14	3	92.0
Fulcaster	6471	97	10	39	57.6	21.8	----		22.4	16	7	91.9
Chiefkan	11754	100	11	39	58.1	21.4	----		----		2	96.9
Penquite selection	11745	100	11	37	58.3	20.9	----		25.9	7	4	97.4
Turkey selection (1-27-84)	----	100	13	38	56.6	19.7	----		----		1	81.1
Harvest Queen	6199	100	10	42	56.8	18.7	24.6	13	22.2	17	8	87.2
Turkey	1558	100	13	37	56.7	14.4	27.1	11	23.0	15	8	96.1
Blackhull	6251	100	7	37	56.3	13.3	----		20.6	18	7	96.8
Early Blackhull	8856	97	1	35	57.4	13.0	24.7	12	19.3	19	8	87.6

Standard error of a difference, 2.18 bu.; standard error of a mean, 1.54 bu., or 6.55 percent.

Table 1. - (Continued)

Woodward, Oklahoma

(Four 1/47th-acre plots. two on cropped land, two on fallow)

Variety	C. I. No.	Date Headed	Date Ripe	Height	Leaf rust	Lodging	Shattering	Test wt. (per bu.)	Av. acre yield	Yield Av. 1931-34 and 1936-38	Yield Rank	No. of years grown	Percentage of Kharkof for same years
		(June)		(In.)	(Pct.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)	(Bu.)			
Kawvale x Tenmarq	11669	May 11	14	44	16	20	0	61	56.3	-----		1	155.5
Tenmarq x Nebr. No. 28	11847	May 11	15	49	43	4	0	59	45.8	-----		1	126.5
Kawvale	8180	May 13	14	48	15	10	5	57	45.3	25.8	5	7	97.4
Quivira	8886	May 8	13	45	24	20	0	59	44.2	26.9	2	7	101.5
Oro x Tenmarq	11673	May 10	14	45	23	20	0	59	43.9	-----		1	121.3
Chiefkan	11754	May 11	14	48	35	T	0	60	43.2	-----		2	132.3
Turkey selection	10016	May 11	14	44	55	16	0	59	42.8	-----		4	101.5
Tenmarq	6936	May 12	13	47	48	8	0	57	41.3	27.3	1	7	103.0
Danne selection H-59-C	------	May 11	14	45	70	30	0	58	40.5	-----		1	111.9
Kanred	5146	May 14	15	47	75	20	0	56	36.4	25.0	7	7	94.3
Kharkof	1442	May 16	16	47	76	1	0	56	36.2	26.5	3	7	100.0
Cheyenne	8885	May 14	15	46	74	T	0	57	35.6	25.9	4	7	97.7
Oro	8220	May 15	15	48	71	T	0	58	35.5	24.1		7	90.9
Sibley No. 62	11523	May 14	15	47	68	T	0	56	35.1	-----		4	95.4
Turkey (Local) Wd. 1008	------	May 16	15	47	70	T	0	57	34.1	25.5	6	7	96.2
Denton	8265	May 14	16	49	19	9	3	58	33.2	21.8	11	7	82.3
Fulcaster	6471	May 15	15	50	50	T	10	57	31.4	23.7	9	7	89.4
Blackhull	6251	May 13	14	47	71	48	0	58	28.5	24.6	8	7	92.8
Early Blackhull	8856	Apr. 26	7	39	64	40	0	57	27.2	23.2	10	7	87.5

Standard error of a difference, 2.11 bu.; standard error of a mean, 1.49 bu., or 3.84 percent.

Table 1. - (Continued)

Colby, Kansas

(Three 1/50th-acre plots)

Variety	C. I. No.	Date Headed (May)	Date Ripe (June)	Hgt. (In.)	Test weight (per bu.) (Lbs.)	Av. acre yield (Bu.)	Yield Av. 1931-32 1934-38 (Bu.)	Yield Rank	No. of years grown	Percentage of Kharkof for same years
Chiefkan	11754	16	29	25	61	12.9	----		1	135.8
Blackhull	6251	18	26	23	61	10.6	27.2	1	4	111.0
Kanred	5146	20	30	21	61	10.1	24.0	5	4	98.0
Kharkof	1442	20	30	21	61	9.5	24.5		4	100.0
Nebraska No. 60	6250	20	30	22	60	9.2	----		3	97.9
Turkey	1558	20	30	20	61	8.9	24.2	4	4	98.8
Early Blackhull	8856	11	24	25	61	8.9	23.7	6	4	96.7
Oro x Tenmarq	11673	15	26	20	61	8.9	----		1	93.7
Tenmarq	6936	17	27	21	60	8.6	----		3	97.6
Kanred x Marquis	11589	16	25	20	60	8.5	----		1	89.5
Cheyenne	8885	20	30	19	60	8.3	26.7	2	4	109.0
Oro	8220	20	30	21	62	8.2	24.4	3	4	99.6
Nebred	10094	20	30	18	61	7.5	----		1	78.9

Standard error of a difference, 1.05 bu.; standard error of a mean, .74 bu., or 8.01 percent.

Table 1. - (Continued)

Hays, Kansas

(Four 1/50th-acre plots; two on fallow, two on cropped land; seeded Sept. 28, 1937; emerged Oct. 4, 1937)

Variety	C. I. No.	Date Headed (May)	Date Ripe (June)	Hgt. (In.)	Rust Leaf (Pct.)	Rust Stem (Pct.)	Frost Injury (Pct.)	Test weight (per bu.) (Lbs.)	Av. acre yield (Bu.)	Yield Av. 1931-34 1936-38 (Bu.)	Rank	Yield Av. 1936-1938 (Bu.)	Rank	No. of years grown	Percentage of Kharkof for same years
Kawvale x Tenmarq	11669	10	19	36	0	25	4.0	63	42.0	----		----		1	190.0
Quivira	8886	8	20	37	14	15	T	61	31.3	26.2	1	30.9	1	7	122.4
Chiefkan	11754	11	21	39	29	40	2.0	64	30.8	----		30.7	2	3	127.4
Kanred x Marquis	11589	12	21	39	36	43	2.0	61	30.3	----		29.2	3	3	121.2
Oro x Tenmarq	11673	10	21	38	23	15	2.5	62	29.6	----		----		2	116.1
Tenmarq	6936	13	20	40	34	33	4.0	60	28.3	25.7	2	29.2	3	7	120.1
Early Blackhull Hybrid H.C. 364	------	12	21	39	90	15	2.0	59	24.3	----		----		1	110.0
Kanred	5146	16	23	39	59	33	0	57	23.5	----		----		6	111.7
Blackhull	6251	14	21	39	70	15	1.5	61	23.5	25.0	3	27.0	5	7	116.8
Cheyenne	8885	16	23	40	81	50	T	58	23.4	24.8	4	26.2		7	115.9
Nebred	10094	16	22	37	96	43	.5	60	22.2	----		25.6		3	106.2
Kharkof	1442	17	23	39	43	50	T	58	22.1	21.4		24.1		7	100.0
Early Blackhull	8856	4	15	33	100	5	2.5	62	21.9	24.9		25.3		7	116.4
Turkey	1558	16	23	39	83	43	.5	59	21.5	22.1		23.6		7	103.3
Oro	8220	17	23	41	59	33	T	57	20.9	22.8		24.3		7	106.5
Nebraska No. 60	6250	18	23	41	76	70	T	58	19.3	22.7		23.1		7	106.1
Blackhull Hybrid H.C. 369	------	16	21	41	100	10	T	58	16.5	----		----		1	74.7

Standard error of a difference, 1.36 bu.,; standard error of a mean, .96 bu., or 3.78 percent.

Table 1. - (Continued)

Manhattan, Kansas

(Three 1/40th-acre plots)

Variety	C. I. No.	Date Headed (May)	Date Ripe (June)	Number plants per acre in fall (1,000)	Number culms at maturity (1,000)	Height (In.)	Lodging (Pct.)	Wt. 100 10 cm. sections straw (Gms.)	Rust Stem (Pct.)	Rust Leaf (Pct.)	Weight per 1,000 kernels (Gms.)	Test weight (per bu.) (Lbs.)	Av. acre yield (Bu.)	Yield Av. 1931-1938 (Bu.)	Rank	Yield Av. 1937-1938 (Bu.)	Rank	No. of years grown	Percentage of Kharkof for same years
Kawvale x Tenmarq	11669	18	24	932	1,613	35	0	9.76	32	32	25.29	56.1	27.2	----		39.7	1	2	168.2
Kawvale x Tenmarq	11951	18	26	839	1,352	37	0	11.38	43	17	27.96	56.1	26.8	----		----		1	225.2
Kawvale x Tenmarq	11750	18	25	947	1,403	35	0	10.00	32	37	24.15	52.7	23.6	----		37.2	2	2	157.6
Kawvale x Tenmarq	11950	18	25	824	1,394	38	T	10.80	32	17	23.54	51.2	22.4	----		----		1	188.2
Oro x Tenmarq	11673	19	26	795	1,182	37	2	10.78	32	10	24.82	53.0	22.4	----		35.3	3	2	149.6
Oro x Tenmarq	11672	18	26	838	1,187	37	0	10.91	32	7	23.77	52.9	21.0	----		33.4	6	2	141.5
P-1066-1 x Prelude	11590	16	24	1,020	1,373	36	T	10.29	17	38	22.70	55.3	20.4	----		34.8	4	5	112.9
Kawvale	8180	22	26	927	1,435	38	0	10.63	40	37	23.12	53.2	20.2	38.1	1	29.3	10	8	115.5
Quivira	8886	18	23	947	1,320	37	0	9.92	17	37	23.45	54.5	19.9	37.0	2	33.8	5	8	112.1
Chiefkan	11754	19	25	936	1,388	40	20	10.69	12	57	24.13	57.0	19.5	----		32.5	8	2	137.7
Tenmarq	6936	21	25	819	1,273	38	2	11.08	47	46	22.67	50.8	19.0	36.0	5	31.2	9	8	109.1
Kanred x Marquis	11589	19	25	891	1,351	36	0	10.58	33	40	22.54	52.2	18.6	----		32.9	7	6	112.2
Clarkan	8858	22	26	890	1,053	43	15	13.28	38	68	25.54	56.2	17.3	36.6	4	27.4	14	8	110.9
Fulcaster	6471	21	25	961	1,317	41	12	11.10	55	98	23.53	53.4	16.1	35.0	7	25.1	19	8	106.1
Oro x Tenmarq (Ks.No.2736)		27	29	817	1,244	37	0	11.37	48	8	20.51	47.8	15.7	----		----		1	131.9
Kanred	5146	25	27	888	1,449	37	5	8.42	25	63	21.02	49.4	15.2	34.1	10	29.2	11	8	103.3
Turkey (Farm)	1558	27	26	975	1,553	36	3	8.73	32	87	20.67	49.3	12.6	----		----		1	105.9
Cheyenne	8885	23	27	912	1,374	35	T	8.85	52	90	20.54	49.5	12.4	36.7	3	26.7	16	8	111.2
Turkey (Plot)	1558	27	27	948	1,471	37	T	8.74	32	87	21.10	50.9	12.3	34.4	9	26.9	15	8	104.2
Oro	8220	26	27	954	1,388	36	0	8.85	45	90	20.79	49.6	12.2	34.1	10	25.7	18	8	103.3
Nebred	10094	23	24	926	1,258	33	0	8.51	30	100	20.94	50.1	12.2	----		28.5	13	4	116.8
Kharkof	1442	27	27	1,043	1,503	36	T	8.81	40	92	21.03	49.6	11.9	33.0	12	23.6	20	8	100.0
Blackhull	6251	21	26	954	1,490	37	75	8.75	17	97	22.26	52.0	11.9	35.6	6	28.8	12	8	107.9
Early Blackhull	8856	13	21	878	1,155	32	77	9.66	10	97	23.23	54.0	10.4	34.8	8	26.3	17	8	105.5
Harvest Queen	6199	25	26	929	1,069	42	43	11.51	55	97	22.23	52.7	10.3	29.7	13	20.7	21	8	90.0

Standard error of a difference, 1.12 bu.; standard error of a mean, .79 bu., or 4.57 percent.

Table 1. - (Continued)

Akron, Colorado

(Four 1/41-acre plots; two on corn land, two on fallow)

Variety	C. I. No.	Winter survival	Date Headed	Date Ripe	Hgt.	Rust Stem	Rust Leaf	Lodging	Test weight (per bu.)	Av. acre yield	Yield Av. 1931-1938	Yield Rank	Yield Av. 1936-1938	Yield Rank	No. of years grown	Percentage of Kharkof for same years
		(Pct.)	(May)		(In.)	(Pct.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)	(Bu.)		(Bu.)			
Kawvale x Tenmarq	11669	94	25	July 3	30	2	3	0	56.7	30.5	-----		-----		1	144.5
Nebred	10094	94	26	July 3	34	1	5	2	53.3	25.6	-----		21.7	1	3	117.9
Akron No. 7	11660	95	26	July 6	35	4	14	T	53.8	24.9	-----		21.5	2	5	127.6
Oro x Tenmarq	11673	94	25	July 2	33	T	T	2	55.9	24.5	-----		-----		1	116.1
Kanred x Marquis (Akron 44)	-----	94	25	July 5	35	4	1	T	52.8	23.6	-----		-----		1	111.8
Early Blackhull	8856	91	20	June 30	29	2	7	1	58.4	23.6	14.9	2	20.0	6	8	118.3
Kanred-Hard Fed. x Minhardi-Minturki (Akron 130)	11970	94	24	July 5	34	2	39	T	55.4	23.5	-----		-----		1	111.4
Kharkof	1583	96	28	July 4	36	T	9	1	52.3	22.9	12.6	7	19.2	10	8	100.0
Blackhull	6251	93	24	July 2	35	3	9	10	56.2	22.5	15.0	1	19.7	9	8	119.0
Turkey selection	10098	94	25	July 3	32	T	7	T	53.2	22.5	-----		19.9	7	5	117.2
Turkey x Marquis	11747	91	25	July 3	32	1	17	0	53.8	22.4	-----		20.8	3	3	113.0
Cheyenne	8885	94	27	July 4	35	4	41	0	52.2	22.4	14.0	4	20.2	5	8	111.1
Minturki	6155	98	26	July 6	27	1	41	T	51.0	21.4	11.3	9	17.9	14	8	89.7
Tenmarq	6936	94	25	July 3	34	12	3	1	53.2	21.4	14.6	3	20.5	4	8	115.9
Kharkof	1442	94	27	July 5	34	2	18	T	54.8	21.1	12.6	7	18.4	13	8	100.0
Yogo	8033	96	28	July 5	37	2	48	T	49.5	20.8	-----		-----		6	102.7
Turkey selection	10016	94	26	July 2	31	9	9	T	56.2	20.8	-----		19.9	7	7	119.1
Kanred	5146	94	26	July 4	34	1	19	T	53.7	20.5	13.9	5	19.2	10	8	110.3
Oro	8220	91	27	July 5	36	10	34	0	53.7	20.5	13.6	6	18.6	12	8	107.9
Chiefkan	11754	93	25	July 1	34	5	3	18	52.2	18.6	-----		-----		1	88.2
Alton	1438	95	28	July 6	36	5	29	2	52.0	17.6	10.8	10	15.4	15	8	85.7

Standard error of a difference, 2.61 bu.; standard error of a mean, 1.84 bu., or 8.18 percent.

Table 1. - (Continued)

Lincoln, Nebraska

(Five 1/40th-acre plots; Seeded Oct. 14, 1937; Emerged Oct. 29, 1937)

Variety	C. I. No.	Winter survival	Date Headed	Date Ripe	Height	Lodging	Leaf rust	Number culms per acre	Test weight (per bu.)	Av. acre yield	Yield Av. 1931-1938	Rank	Yield Av. 1936-1938	Rank	No. of years grown	Percentage of Kharkof for same years
					(In.)	(Pct.)	(Pct.)	(1,000)	(Lbs.)	(Bu.)	(Bu.)		(Bu.)			
Chiefkan	11754	85	May 31	June 30	45.0	17	15	1,956	57.0	21.0	----		----		1	128.8
Kawvale x Tenmarq	11669	49	June 3	July 2	39.0	4	3	2,334	55.6	20.6	----		22.5	1	3	107.7
Oro x Tenmarq	11673	76	May 31	July 1	41.0	9	T	2,054	53.7	18.8	----		----		1	115.3
Nebred	10094	97	June 1	June 29	38.2	17	83	2,580	55.4	17.7	29.2	4	21.6	2	8	104.3
Cheyenne selection	11666	93	June 1	June 29	38.8	13	78	2,438	56.0	17.0	----		21.0	4	3	100.5
Kawvale	8180	71	June 5	July 4	40.2	3	3	2,005	54.1	16.7	30.0	2	18.9	21	8	107.1
Tenmarq x Minturki	11580	79	June 2	July 1	40.6	6	5	2,251	52.6	16.7	----		----		2	93.8
Clarkan	8858	85	June 2	July 1	47.0	15	8	1,606	54.3	16.5	----		20.6	6	4	104.3
Kharkof	1442	94	June 3	July 2	39.2	2	48	2,035	56.8	16.3	28.0	9	20.9	5	8	100.0
Kanred	5146	88	June 4	July 2	39.2	8	25	2,091	55.1	16.2	28.1	8	21.6	2	8	100.4
Turkey selection	10016	90	May 31	June 29	39.6	4	68	2,554	54.8	16.2	27.6	10	19.6	14	8	98.6
Turkey selection	10015	90	June 2	June 30	40.0	3	85	2,315	56.1	15.8	26.8	14	19.0	18	8	95.7
Blackhull	6251	79	June 2	July 2	41.6	7	50	2,147	57.7	15.7	28.2	7	19.3	16	8	100.7
Tenmarq	6936	74	June 3	July 2	40.0	4	23	2,016	52.8	15.7	29.2	4	20.0	10	8	104.3
Turkey (S. Dak. 144)	3689	96	June 1	June 30	38.0	32	75	2,543	55.3	15.6	29.3	3	20.6	6	8	104.6
Turkey (Seward Co.)	-----	92	June 1	July 1	39.6	13	78	2,520	56.0	15.4	28.4	6	20.1	9	8	101.4
Turkey (Sonderegger)	-----	89	June 2	July 1	38.2	1	80	2,659	57.2	15.1	----		----		1	92.6
Minturki x Blackhull	11815	88	June 1	July 2	43.8	16	48	2,184	56.5	14.9	----		----		1	91.4
Kanred x Blackhull	11844	84	May 31	June 30	42.0	31	63	2,304	52.8	14.6	----		----		1	89.6
Turkey	-----	93	June 3	July 2	38.4	3	73	2,255	57.8	14.5	27.0	12	20.5	8	8	96.4
Blackhull selection	-----	68	June 3	July 2	41.0	7	55	2,065	57.5	14.5	----		----		1	89.0
Blackhull selection	11737	90	June 1	June 30	38.8	26	63	2,132	55.6	14.5	----		----		2	95.7
Turkey selection	11577	89	June 1	June 30	38.8	6	83	2,464	55.3	14.3	----		19.7	12	4	99.5
Cheyenne	8885	88	June 3	July 2	39.0	1	63	2,184	54.8	13.7	30.3	1	19.8	11	8	108.2
Turkey selection	11576	90	June 2	July 1	38.4	8	85	2,292	56.2	13.6	----		19.1	17	4	97.6
Nebraska No. 60	6250	94	June 4	July 3	38.6	0	70	2,382	54.4	12.9	26.4		19.4	15	8	94.3
Minturki x Blackhull	11671	88	June 2	July 1	43.6	49	43	1,826	52.6	12.9	----		----		2	78.4
Turkey	-----	91	June 4	July 2	38.2	1	68	2,226	57.8	12.7	27.0	12	19.6	13	8	96.4
Turkey selection	11734	85	June 3	July 2	38.6	1	83	2,460	57.7	12.4	----		----		2	83.3
Oro x Tulhard	11579	79	June 3	July 1	38.4	5	73	2,001	54.8	12.1	----		19.0	18	4	94.2
Oro	8220	82	June 5	July 4	37.6	1	60	2,240	56.1	11.7	27.1	11	19.0	18	8	96.8

Standard error of a difference, 1.17 bu.; standard error of a mean, .83 bu., or 5.39 percent.

Table 1. - (Continued)

North Platte, Nebraska

(Four 1/40th-acre plots; Seeded Sept. 16, 1937; Two on fallow, two on corn land)

Variety	C. I. No.	Date headed	Hgt.	Test weight (per bu.)	Av. acre yield	Yield Av. 1931-36 and 1938	Rank	No. of years grown	Pct. of Kharkof for same years
			(In.)	(Lbs.)	(Bu.)	(Bu.)			
Kawvale x Tenmarq	11669	May 25	34.5	51.0	18.8	----		1	131.5
Chiefkan	11754	May 27	39.5	53.0	16.8	----		1	117.5
Cheyenne	8885	May 30	35.5	54.0	16.5	25.1	1	7	103.1
Nebraska No. 60	6250	May 31	34.0	54.0	15.3	23.9	5	7	100.0
Oro x Tenmarq	11673	May 26	35.5	52.0	15.0	----		1	104.9
Cheyenne selection	11666	May 29	33.0	52.0	14.6	----		2	102.1
Kharkof	1442	May 31	37.5	52.0	14.3	----		6	100.0
Nebred	10094	May 29	35.5	53.0	13.7	----		5	104.6
Oro	8220	May 31	36.0	50.0	13.5	23.4	8	7	96.9
Turkey selection	10016	May 27	35.0	50.0	13.3	24.1	4	7	99.6
Blackhull	6251	May 29	35.0	51.5	13.1	23.7	6	7	98.4
Tenmarq	6936	May 30	36.0	50.0	12.7	24.2	2	7	99.6
Kanred	5146	May 31	36.0	50.0	12.5	22.7	9	7	94.5
Beloglina x Hussar (N.P. 126)	11513	May 30	32.0	53.0	12.3	----		2	86.0
Turkey (Local)	-----	May 26	35.5	48.5	12.2	24.2	2	7	101.2
North Plate 11	8884	May 31	35.5	51.5	11.8	23.6	7	7	98.0
Beloglina x Hussar (N.P. 93)	11664	May 30	36.0	51.5	9.3	----		3	89.4
Alton	1438	June 1	39.5	50.5	8.5	----		1	59.4

Standard error of a difference, 1.15 bu.; standard error of a mean, .81 bu., or 5.96 percent.

Table 1. - (Continued)

Alliance, Nebraska

(Six 1/38th-acre plots; Three on stubble, three on fallow)

Variety	C. I. No.	Winter survival	Date Headed	Date Ripe	Hgt.	Leaf rust	Test wgt. (per bu.)	Av. acre yield	Yield Av. 1931, 1933 and 1938	Yield Rank	No. of years grown	Pct. of Kharkof for same years
		(Pct.)	(June)	(July)	(In.)	(Pct.)	(Lbs.)	(Bu.)	(Bu.)			
Cheyenne	8885	95	10	13	32.0	20	60.0	23.3	19.6	2	3	111.4
Kawvale x Tenmarq	11669	90	6	11	33.7	5	57.5	22.9	----		1	119.3
Turkey selection	10016	88	7	12	35.3	55	60.0	22.2	19.7	1	3	111.9
Cheyenne selection	11666	90	9	12	31.3	45	59.8	22.2	----		1	115.6
Nebraska No. 60	6250	95	11	14	35.3	50	58.0	22.1	18.7	3	3	106.3
Oro x Tenmarq	11673	90	6	11	33.0	40	59.0	22.0	----		1	114.6
Chiefkan	11754	95	7	12	36.7	5	60.0	21.8	----		1	113.5
Turkey selection	10094	95	10	13	27.7	55	58.8	20.6	----		2	104.4
Tenmarq	6936	95	8	13	33.3	25	58.0	20.4	18.3	6	3	104.0
Blackhull	6251	86	7	11	35.0	20	59.0	20.0	18.5	5	3	105.1
Turkey selection	10015	86	11	13	31.7	55	58.5	19.6	18.1	7	3	102.8
Oro	8220	91	10	13	31.7	35	60.4	19.4	18.7	3	3	106.3
Kharkof	1442	92	10	13	36.3	15	59.0	19.2	17.6		3	100.0
Yogo	8033	90	14	15	31.7	35	58.3	18.6	----		1	96.9

Standard error of a difference, 2.73 bu.; standard error of a mean, 1.93 bu., or 9.19 percent.

Valentine, Nebraska

(Two plots)

Variety	C. I. No.	Stand	Test weight (per bu.)	Av. acre yield	Yield Av. 1931 and 1938	Yield Rank	No. of years grown	Percentage of Kharkof for same years
		(Pct.)	(Lbs.)	(Bu.)	(Bu.)			
Turkey selection	10016	90	59.5	4.4	6.8	1	2	103.0
Chiefkan	11754	90	61.0	4.2	---		1	116.7
Quivira	8886	95	59.0	4.0	5.8	4	2	87.9
Oro x Tenmarq	11673	90	59.0	3.8	---		1	105.6
Kharkof	1442	85	59.0	3.6	6.6	3	2	100.0
Turkey selection	10015	75	58.5	3.4	6.7	2	2	101.5
Kanred	5146	50	58.5	3.0	5.5	6	2	83.3
Blackhull	6251	25	58.0	2.4	5.8	4	2	87.9
Tenmarq	6936	80	58.0	2.2	5.3	7	2	80.3
Kawvale x Tenmarq	11669	35	59.0	2.2	---		1	61.1

Table 1. - (Continued)

Waseca, Minnesota

(Three 1/40th-acre plots)

Variety	C. I. No.	Winter survival	Date		Hgt.	Lodging		Rust		Grain		Test weight (per bu.)	Av. acre yield	Yield					Percentage of Kharkof for same years
			Headed	Ripe		Pct.	De-gree	Leaf	Stem	Plump	Tex-ture			Av.1931-1933,1935 and 1937-1938	Rank	Av. 1937-1938	Rank	No.of years grown	
		(Pct.)	(June)	(July)	(In.)			(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)	(Bu.)		(Bu.)			
Minhardi x Marquis	11657	88	18	19	48	33	29	7	70	90	75	59.3	33.0	-----		27.7	1	4	119.7
Nebred	10094	83	15	13	38	63	12	13	93	87	77	56.1	30.2	-----		26.3	2	2	149.4
Minturki x Marquis (Minn. 2552)	-----	88	18	18	45	63	20	23	73	90	75	58.7	29.5	-----		25.8	3	2	146.6
Minturki x Marquis	11502	95	17	18	43	77	28	13	72	93	75	58.4	29.4	-----		24.3	6	4	111.6
Minard x Minhardi	8888	100	19	18	44	23	20	40	100	83	80	58.2	29.2	33.3	3	25.8	3	6	108.8
Yogo	8033	88	18	18	44	82	27	13	67	90	80	58.0	28.5	33.4	2	24.0	7	6	109.2
Minturki	6155	88	18	18	44	70	21	17	83	88	65	57.6	27.5	34.2	1	24.9	5	6	111.8
Minturki x Marquis	11501	92	18	19	47	7	20	25	73	90	75	58.1	27.4	-----		24.0	7	4	115.3
Kharkof	1442	78	19	18	43	77	32	37	87	83	72	53.4	21.5	30.6	4	17.6	9	6	100.0

Standard error of a difference, 1.64 bu.; standard error of a mean, 1.16 bu., or 4.07 percent.

St. Paul, Minnesota

(Three 1/40-thacre plots)

Variety	C. I. No.	Winter survival	Date		Hgt.	Lodging		Rust		Grain		Test weight (per bu.)	Av. acre yield	Yield	
			Headed	Ripe		Pct.	De-gree	Stem	Leaf	Plump	Tex-ture			Av. 1937-1938	Rank
		(Pct.)	(June)	(July)	(In.)			(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)	(Bu.)	
Minturki	6155	52	19	20	44	0	0	10	80	88	72	53.8	27.0	24.0	2
Minard x Minhardi	8888	87	18	20	43	0	0	28	80	83	80	54.9	27.0	26.9	1
Minhardi x Marquis	11657	40	18	21	45	0	0	10	70	83	75	54.8	25.3	22.1	5
Minturki x Marquis	11502	38	18	20	43	33	10	15	67	87	75	53.6	22.2	23.5	3
Minturki x Marquis (Minn. 2552)	-----	32	19	22	44	33	5	18	67	87	80	54.2	20.3	20.6	6
Minturki x Marquis	11501	47	19	21	45	3	25	43	83	88	72	52.2	20.2	22.7	4
Minhardi	5149	60	21	20	45	0	0	100	100	45	55	41.4	7.2	18.8	7
Minard	6690	20	23	22	46	100	10	60	80	40	70	40.4	3.0	14.2	8

Table 1.-(Continued)

Grand Rapids, Minnesota

(Three 1/40th-acre plots)

Variety	C. I. No.	Date		Height	Rust		Grain		Test weight	Average acre yield
		Headed	Ripe		Stem	Leaf	Plump	Texture	(per bu.)	
		(June)	(July)	(In.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)
Minhardi x Marquis	11657	27	30	38	53	100	92	78	57.5	16.9
Yogo	8033	28	29	38	53	100	90	85	56.7	15.7
Minturki	6155	25	25	35	48	100	92	73	56.5	14.9
Minturki x Marquis (Minn. 2552)	-----	27	30	36	48	100	93	80	57.4	14.2
Minturki x Marquis	11502	26	28	36	67	100	92	78	57.5	13.3
Minard x Minhardi	8888	27	27	34	72	95	77	80	54.2	11.0
Minturki x Marquis	11501	27	27	38	72	85	83	75	54.0	10.2

Standard error of a difference, 1.95 bu.; standard error of a mean, 1.38 bu., or 10.05 percent.

Sheridan, Wyoming

(Three 1/55th-acre plots; Seeded Oct. 6, 1937; Emerged Nov. 1, 1937)

Variety	C. I. No.	Date		Winter survival	Height	Test weight (per bu.)	Av. acre yield	Yield				No. of years grown	Percentage of Kharkof for same years
		Headed	Ripe					Av. 1931-1938	Rank	Av. 1937-1938	Rank		
		(June)	(July)	(Pct.)	(In.)	(Lbs.)	(Bu.)	(Bu.)		(Bu.)			
Nebraska No. 60	6250	20	24	90	39	61	46.4	25.1	4	32.1	1	8	105.5
Montana No. 36	5549	20	25	90	41	61	45.8	25.7	1	30.4	4	8	108.0
Nebred	10094	19	20	90	35	61	44.9	-----		29.2	8	2	97.3
Cheyenne	8885	18	22	90	33	61	44.6	-----		30.9	3	4	115.6
Kharkof	1442	20	25	90	37	61	44.4	23.8	5	30.0	6	8	100.0
Kanred	5146	18	22	90	36	61	44.3	25.4	2	30.1	5	8	106.7
Turkey	10016	16	19	90	36	60	43.4	-----		28.1	9	5	98.3
Karmont	6700	21	25	88	40	61	42.8	23.8	5	27.2	12	8	100.0
Minard x Minhardi	8888	20	25	88	39	61	42.5	-----		29.7	7	3	99.1
Yogo	8033	21	25	88	44	61	42.5	25.3	3	31.7	2	8	106.3
Minturki	6155	20	25	90	42	61	41.9	21.6	7	28.0	10	8	90.8
Minturki x Marquis	11502	19	24	90	43	61	40.0	-----		27.4	11	3	93.3

Standard error of a difference, 2.36 bu.; standard error of a mean, 1.67 bu., or 3.83 percent.

Table 1. - (Continued)

Bozeman, Montana

(Three 1/56-acre plots)

Variety	C. I. No.	Date Headed (June)	Date Ripe (Aug.)	Lodging (Pct.)	Test weight (per bu.) (Lbs.)	Av. acre yield (Bu.)	Yield Av. 1931 and 1933-38 (Bu.)	Rank	Yield Av. 1937-1938 (Bu.)	Rank	No. of years grown	Percentage of Kharkof for same years
Cheyenne	8885	27	12	78	61.5	68.2	----		77.1	1	5	110.1
Minturki	6155	27	9	72	61.2	67.5	65.0	5	67.2	8	7	96.3
Yogo	8033	30	11	90	61.5	65.6	70.8	1	69.8	5	7	104.9
Nebred	10094	24	9	60	61.9	65.0	----		74.1	2	2	113.3
Montana No. 36	5549	27	11	83	61.6	64.1	64.9	6	64.4	12	7	96.1
Minard x Minhardi	8888	26	11	48	62.6	64.1	----		71.6	3	3	105.0
Minard x Minhardi	8889	26	12	68	61.8	62.8	67.0	4	71.2	4	7	99.3
Newturk	6935	28	13	78	61.3	61.9	62.0	7	66.3	9	7	91.9
Nebraska No. 60	6250	28	11	80	60.9	61.6	68.9	2	69.6	6	7	102.1
Yogo selection 2	-----	28	12	88	61.5	60.4	----		67.9	7	4	103.1
Kharkof	1442	29	12	78	61.5	60.0	67.5	3	65.4	10	7	100.0
Minturki x Marquis	11502	24	7	55	61.7	58.8	----		63.8	13	3	90.7
Oro	8220	28	12	88	62.4	55.4	----		65.2	11	5	91.4
Karmont	6700	28	11	85	60.9	55.0	----		----		5	97.3
Eureka x Minhardi	8036	25	13	72	61.3	47.3	----		63.7	14	3	95.1

Standard error of a difference, 4.30 bu.; standard error of a mean, 3.04 bu., or 4.99 percent.

Table 1. - (Continued)

Moccasin, Montana

(Four 1/50th-acre plots; Seeded Sept 9, 1937; Emerged Oct. 7, 1937)

Variety	C. I. No.	Date Headed	Date Ripe	Hgt.	Bunt	Test weight (per bu.)	Av. acre yield	Yield Av.1931-35 and 1937-38	Rank	Yield Av. 1937-1938	Rank	No. of years grown	Percentage of Kharkof for same years
		(June)		(In.)	(Pct.)	(Lbs.)	(Bu.)	(Bu.)		(Bu.)			
Karmont	6700	22	July 31	34	71	64.0	34.5	16.2		19.8	4	7	102.5
Turkey x Kanred	11725	23	July 30	37	68	62.5	33.7	----		20.4	1	2	109.1
Yogo	8033	23	July 30	36	8	63.5	33.0	17.6	3	20.2	2	7	111.4
Turkey x Minessa	8887	24	Aug. 3	39	50	61.9	32.6	17.7	2	20.0	3	7	112.0
Turkey	1558	22	July 30	35	69	64.0	32.5	15.7		18.4	11	7	99.4
Kharkof	1442	21	July 30	33	63	63.3	32.3	15.8		18.7	8	7	100.0
Kanred x Minessa	8045	22	July 31	34	13	64.0	31.7	16.9	4	19.5	5	7	107.0
Newturk	6935	19	July 29	33	75	63.3	31.4	16.0		19.1	6	7	101.3
Kanred x Minhardi	11726	22	July 31	33	59	63.5	31.0	----		18.4	11	2	98.4
Minturki	6155	22	July 30	36	12	62.5	30.9	15.3		17.8	15	7	96.8
Minturki x Bel.-Buffum	11661	23	July 30	37	5	62.0	30.3	----		18.5	10	2	98.9
Eureka x Minhardi	8036	21	July 30	34	72	63.8	30.1	17.8	1	18.7	8	7	112.7
Minhardi x Minturki	8034	21	July 31	38	80	63.7	30.0	16.6	5	18.9	7	7	105.1
Cheyenne	8885	19	July 29	31	78	64.4	29.9	----		18.4	11	4	96.6
Minard x Minhardi	8888	23	July 31	33	47	63.5	29.4	----		18.0	14	6	100.0
Nebred	10094	19	July 28	27	3	63.8	28.7	----		16.7	17	2	89.3
Minnesa x Bel. Buf. (N.N. 23-2)	-----	27	Aug. 6	39	73	61.4	27.6	----		17.1	16	2	91.4

Standard error of a difference, 1.84 bu.; standard error of a mean, 1.30 bu. or 4.17 percent.

Table 1. - (Continued)

Havre, Montana

(Three 1/50th-acre plots; Seeded Oct. 12, 1937; Emerged Oct. 26, 1937)

Variety	C. I. No.	Date Headed (June)	Date Ripe (July)	Hgt. (In.)	Test weight (per bu.) (Lbs.)	Av. acre yield (Bu.)	Yield Av. 1931-35 and 1938 (Bu.)	Rank	No. of years grown	Percentage of Kharkof for same years
Karmont	6700	16	23	35	60.2	21.4	9.8	3	6	119.5
Yogo	8033	18	24	35	60.0	21.4	10.7	1	6	130.5
Minhardi x Minturki	8034	18	24	36	60.6	21.1	9.5	5	6	115.9
Turkey x Minessa (Havre selection)	8028	19	24	36	58.9	21.1	9.8	3	6	119.5
Kanred	5146	14	23	30	60.4	20.8	9.4	7	6	114.6
Minturki	6155	17	24	36	59.7	20.8	9.9	2	6	120.7
Kharkof	1442	16	24	33	60.2	19.2	8.2	11	6	100.0
Montana No. 36	5549	16	23	32	61.0	18.9	9.5	5	6	115.9
Newturk	6935	15	23	35	61.2	18.6	9.0	8	6	109.8
Minard x Minhardi	8888	18	24	35	60.6	18.6	----		4	103.9
Minard x Minhardi	8889	18	24	36	60.6	16.9	8.6	10	6	104.9
Minhardi x Minturki	8215	18	24	35	59.3	16.7	8.7	9	6	106.1
Minturki x Marquis	11502	16	24	34	60.4	15.6	----		1	81.3
Turkey selection	10016	15	24	29	59.3	12.8	----		3	78.4
Nebred	10094	16	24	29	60.0	11.2	----		1	80.9

Standard error of a difference, 2.31 bu.; standard error of a mean, 1.63 bu., or 8.86 percent

STANDARD ERRORS

Standard errors have been calculated for yields where possible, the change from probable errors being made for the 1937 data. The accuracy of these errors may be open to question since the plots were not randomized at most of the stations. Random arrangement was used at Denton and at the Minnesota stations. Statisticians do not agree as to whether or not a generalized error obtained from non-randomized plots is of any use. From the agronomic standpoint it is felt that the statistic is of use, although it is realized that the value may not be entirely correct. Just how far wrong it may be is not known.

The analysis of variance was used for the 1938 yield data at each station. Total variance was obtained and from this was subtracted the variance due to varieties and due to replications, the remainder considered as due to error. To obtain the standard error of the mean, the square root of the mean square due to error, or the standard deviation, was divided by the square root of the number of replications for each variety. The standard error of a difference was obtained by multiplying the standard error of a mean by $\sqrt{2}$. This method gives essentially the same answer as the formula used in 1937, and seems to be a little more convenient.

The standard error of an average of averages was determined by the formula -

$$S.\ E.\ = \pm \frac{1}{N} \sqrt{a^2 + b^2 + c^2 + \text{----} n^2}$$

where a, b, and c,---- n are the separate standard errors and N = the number of separate averages. The standard error in bushels may be expressed in percent by dividing the standard error by the mean yield and multiplying by 100. The summary of these standard errors is shown in table 2, together with the number of plots and average yields at each station.

Table 2. - Number of plots, average yield, and standard errors of the mean and difference for plot tests at each cooperating station, 1938.

Station	No. of plots	Average yield of varieties	Standard error of a difference	Standard error of a mean in	
				Bushels	Percent
		(Bu.)	(Bu.)		
Texas:					
Denton	4	21.9	1.83	1.29	5.89
Chillicothe	4	18.2	1.57	1.11	6.10
Amarillo	2	23.9	---	---	---
Bushland	2	9.3	---	---	---
Oklahoma:					
Stillwater	4	23.5	2.18	1.54	6.55
Woodward	4	38.8	2.11	1.49	3.84
Kansas:					
Manhattan	3	17.3	1.12	0.79	4.57
Hays	4	25.4	1.36	0.96	3.78
Colby	3	9.2	1.05	0.74	8.01
Colorado:					
Akron	4	22.5	2.61	1.84	8.18
Nebraska:					
Lincoln	5	15.4	1.17	0.83	5.39
North Platte	4	13.6	1.15	0.81	5.96
Alliance	6	21.0	2.73	1.93	9.19
Valentine	2	3.3	---	---	---
Minnesota:					
Waseca	3	28.5	1.64	1.16	4.07
St. Paul	3	19.0	---	---	---
Grand Rapids	3	13.7	1.95	1.38	10.05
Wyoming:					
Sheridan	3	43.6	2.36	1.67	3.83
Montana:					
Bozeman	3	60.9	4.30	3.04	4.99
Moccasin	4	31.2	1.84	1.30	4.17
Havre	3	18.4	2.31	1.63	8.86

SUMMARY OF YIELDS

The yields of the uniform, as well as other, varieties grown in cooperative experiments have been summarized for the different districts and States. Where possible, average yields are also shown for the complete period over which the test has been continued.

Districts

Summaries of the yield data for the uniform varieties grown in 1938 and the 1931-38 averages, where available, are presented in tables 3 to 8.

In the southern district in 1938 yields were reported from six stations. Eleven varieties were grown uniformly at these stations and the data are shown in table 3 where the varieties are listed in order of average yield. In the case of the three varieties listed at the bottom of the table averages for all of the stations could not be obtained since the varieties were not grown uniformly. Kawvale, Quivira, and Chiefkan had the highest average yields, while Blackhull and Kharkof had the lowest. A second average, including the yields at four stations, is also given. In this case a figure is shown for each of the varieties listed in the table. At these four stations Kawvale x Tenmarq (C. I. 11669), Chiefkan, and Oro x Tenmarq had the highest average yields, while Blackhull and Early Blackhull had the lowest. The behavior of the two hybrid strains is of interest as they were grown uniformly for the first time. Undoubtedly their high yields were due to resistance to leaf rust as well as considerable earliness. Early Blackhull continues to give a poor yield for the district, while the behavior of Blackhull is a little poorer than in previous years. Chiefkan continues to be rather outstanding in yield. For the period (1931-38) averages are shown for seven varieties (table 4). The varieties are listed in order of the weighted average yield based on the results of 45 station-years. Tenmarq continues to have the highest average yield for the period of years, followed by Quivira and Blackhull. At the bottom of the list will be found Kawvale and Denton.

Table 3. - Summary of average yields of the uniform winter wheat varieties grown in plot tests at 6 stations in the southern district, 1938

Variety	C.I. No.	Average yield in bushels per acre at: Denton	Amarillo	Chillicothe	Bushland	Stillwater	Woodward	Average	Average 4 stations	Rank
Kawvale	8180	21.5	25.2	15.1	9.2	32.0	45.3	24.7	26.8	6
Quivira	8886	22.5	21.9	19.1	8.4	32.1	44.2	24.7	26.9	4
Chiefkan	11754	25.2	26.0	22.6	8.5	21.4	43.2	24.5	29.3	2
Tenmarq	6936	21.9	23.2	21.0	10.2	24.9	41.3	23.8	26.9	4
Kanred	5146	18.4	24.3	18.7	9.2	25.6	36.4	22.1	24.5	7
Denton	8265	19.8	25.3	17.9	8.7	27.2	33.2	22.0	24.1	8
Kharkof	1442	11.5	27.3	18.3	10.0	24.3	36.2	21.3	23.3	9
Blackhull	6251	20.1	23.3	20.5	9.4	13.3	28.5	19.2	23.1	10
Kawvale x Tenmarq	11669	28.8	22.1	20.3	---	---	56.3	---	31.9	1
Oro x Tenmarq	11673	29.1	24.2	16.6	---	---	43.9	---	28.5	3
Early Blackhull	8856	28.2	21.2	9.4	---	13.0	27.2	---	21.5	11
Standard error of a mean (bu.)		1.29	--	1.11	--	1.54	1.49	--	--	
Standard error of a mean (pct.)		5.89	--	6.10	--	6.55	3.84	--	--	

Table 4. - Summary of average yields of 7 uniform winter wheat varieties grown in plot tests at 10 stations in the southern district for a part or all of the period 1931-38

Variety	C.I. No.	Average yield in bushels per acre at: Denton	Amarillo	Chillicothe	Bushland	Lawton	Stillwater	Carrier	Helena	Woodward	Goodwell	Weighted average
No. of yrs. grown		8	4	1	1	6	8	3	3	7	4	
Tenmarq	6936	31.7	17.8	21.0	10.2	26.1	28.4	27.8	19.2	27.3	25.1	26.1
Quivira	8886	32.7	17.2	19.1	8.4	27.0	27.7	22.5	20.3	26.9	22.7	25.5
Blackhull	6251	27.3	17.3	20.5	9.4	25.2	27.2 1/	26.9 1/	28.9	24.6	27.3	25.2
Kanred	5146	29.0	17.6	18.7	9.2	25.8	27.7	25.8	16.2	25.0	27.6	24.8
Kharkof	1442	24.3	18.4	18.3	10.0	25.2	28.2	27.3	17.4	26.5	29.3	24.7
Kawvale	8180	29.5	16.6	15.1	9.2	27.0	28.3	25.5	16.0	25.8	21.0	24.5
Denton	8265	27.7	16.9	17.9	8.7	24.5	29.3	25.0	17.7	21.8	21.7	23.7

1/ Grown 1 year less than shown for station.

For the central district data were reported from seven stations in 1938 (table 5). The highest average yields were made by Oro x Tenmarq (C. I. 11673), Chiefkan, and Tenmarq. The varieties ranking lowest were Oro and Kharkof. Based on a 6-station average (excluding Colby), Kawvale x Tenmarq (C. I. 11669) has the highest yield, followed by Oro x Tenmarq (C.I.11673) and Chiefkan with Kharkof and Oro yielding the lowest. It should be pointed out that the two hybrid strains making such a good showing in this district also ranked at or near the top in the southern district. In table 6 the data from each station for all or a part of the period 1931-38 are presented. In this case there are data from seven stations with a total number of 45 station-years. For this period and for the varieties compared, Cheyenne, Blackhull, and Tenmarq have the highest average yields with Oro and Kharkof the lowest.

For the northern district in 1938 the data are presented in table 7. The varieties are arranged in order of the average yield at five of the stations, that is, excluding St. Paul and Grand Rapids. For these stations Yogo, Minturki, and Minard x Minhardi have the highest average yields. A percentage of Kharkof is shown comparing the varieties for all stations grown, and in this case Yogo and Minturki still rank highest. For the period 1931-38 the data are presented in table 8. Because of the nature of the data the varieties are ranked in order of the percentage of Kharkof in comparable tests. Minhardi x Minturki (C. I. 8034) has the highest percentage of Kharkof, followed by Yogo and Kanred. Some of the newer varieties are not included in this table because they have been grown for shorter periods and have not been grown uniformly at all of the stations.

Table 5. - Summary of average yields of 10 winter wheat varieties grown in uniform plot tests at 7 stations in the central district in 1938

Variety	C.I. No.	Average yield in bushels per acre at:							Average		Rank
		Manhattan	Hays	Colby	Akron	Lincoln	North Platte	Alliance	7 stations	6 stations 1/	
Oro x Tenmarq	11673	22.4	29.6	8.9	24.5	18.8	15.0	22.0	20.2	22.1	2
Chiefkan	11754	19.5	30.8	12.9	18.6	21.0	16.8	21.8	20.2	21.4	3
Tenmarq	6936	19.0	28.3	8.6	21.4	15.7	12.7	20.4	18.0	19.6	4
Cheyenne	8885	12.4	23.4	8.3	22.4	13.7	16.5	23.3	17.1	18.6	6
Nebred	10094	12.2	22.2	7.5	25.6	17.7	13.7	20.6	17.1	18.7	5
Blackhull	6251	11.9	23.5	10.6	22.5	15.7	13.1	20.0	16.8	17.8	7
Kharkof	1442	11.9	22.1	9.5	21.1	16.3	14.3	19.2	16.3	17.5	8
Oro	8220	12.2	20.9	8.2	20.5	11.7	13.5	19.4	15.2	16.4	9
Kanred	5146	15.2	23.5	10.1	20.5	16.2	12.5	--	--	--	--
Kawvale x Tenmarq	11669	27.2	42.0	--	30.5	20.6	18.8	22.9	--	27.0	1
Standard error of a mean (bu.)		0.79	0.96	0.74	1.84	0.83	0.81	1.93	0.46	0.53	--
Standard error of a mean (pct.)		4.57	3.78	8.01	8.18	5.39	5.96	9.19	2.54	2.64	

1/ Excluding Colby.

Table 6. - Summary of average yields of uniform varieties of winter wheat grown in plot tests at 7 stations in the central district, 1931-38

Variety	C.I. No.	Average yield in bushels per acre at:							Weighted average
		Manhattan	Hays	Colby	Akron	Lincoln	North Platte	Alliance	
No.of years grown		8	7	4	8	8	7	3	
Cheyenne	8885	36.7	24.8	26.7	14.0	30.3	25.1	19.6	25.8
Blackhull	6251	35.6	25.0	27.2	15.0	28.2	23.7	18.5	25.2
Tenmarq	6936	36.0	25.7	22.2	14.6	29.2	24.2	18.3	25.1
Nebraska No.60	6250	36.0 1/	22.7	28.4 1/	11.5 1/	26.4	23.9	18.7	24.1
Kanred	5146	34.1	22.9 1/	24.0	13.9	28.1	22.7	16.5 1/	24.0
Oro	8220	34.1	22.8	24.4	13.6	27.1	23.4	18.7	23.9
Kharkof	1442	33.0	21.4	29.0 1/	12.6	28.0	23.9	17.6	23.8

1/ Grown 1 year less than shown.

Table 7. - Summary of average yields of 7 varieties of winter wheat grown in uniform plot tests at 7 stations in the northern district in 1938

Variety	C. I. No.	Average yield in bushels per acre at:								Percent of Kharkof for same stations
		St. Paul	Waseca	Grand Rapids	Sheridan	Boze-man	Mocca-sin	Havre	Average 1/	
Yogo	8033	---	28.5	15.7	42.5	65.6	33.0	21.4	38.2	107.6
Minturki	6155	27.0	27.5	14.9	41.9	67.5	30.9	20.8	37.7	106.2
Minard x Minhardi	8888	27.0	29.2	11.0	42.5	64.1	29.4	18.6	36.8	103.7
Nebred	10094	---	30.2	---	44.9	65.0	28.7	11.7	36.1	101.7
Kharkof	1442	---	21.5	---	44.4	60.0	32.3	19.2	35.5	100.0
Minturki x Marquis	11502	22.2	29.4	13.3	40.0	58.8	---	15.6	---	99.2
Karmont	6700	---	---	---	42.8	55.0	34.5	21.4	---	98.5
Standard error of a mean (bu.)				1.38	1.67	3.04	1.30	1.63		
Standard error of a mean (pct.)				10.05	3.83	4.99	4.17	8.86		

1/ Excluding St. Paul and Grand Rapids.

Table 8. - Summary of average yields of 6 uniform winter wheat varieties grown in plot tests at 8 stations in the northern district during all or a part of the period 1931-38

Variety	C. I. No.	Waseca	Average yield in bushels per acre at: Redfield	Dickinson	Archer	Sheridan	Bozeman	Moccasin	Havre	Weighted average	Percent of Kharkof for years grown
No. of years grown		6	2	3	3	8	7	7	6		
Minhardi x Minturki	8034	---	18.6	9.3	11.4	---	---	16.6	11.4	13.5	112.5
Yogo	8033	33.3	24.1	10.9	---	25.3	70.8	17.6	10.7	29.9	109.5
Kanred	5146	---	15.6	---	9.8	25.4	---	---	9.4	16.9	105.6
Nebraska No. 60	6250	---	18.5	10.2	10.4	25.1	68.9	---	---	34.0	103.7
Kharkof	1442	30.6	15.9	8.8	11.1	23.8	67.5	15.8	8.2	26.1	100.0
Minturki	6155	33.0	16.3	10.0	---	21.6	65.0	15.3	9.9	27.0	98.9

States

In most of the States there are two or more cooperating stations from which data have been received. At some of these stations only the uniform varieties are grown, while at others additional varieties are included. It has been the practice to summarize the data by States by averaging the yields from all of the stations within a State. In 1938 only one station reported yields in Colorado and Wyoming so no summaries are shown for these States.

In Texas 11 varieties were grown at Denton, Chillicothe, and Amarillo. The yields from these stations are averaged and presented in table 9. It will be seen that Chiefkan, Kawvale x Tenmarq, and Oro x Tenmarq had the highest average yields. At Bushland, only eight varieties were grown so it is possible to obtain a 4-station average for these varieties only. In this case Chiefkan has the highest average, followed by Tenmarq and Blackhull. During the period 1931-38, 14 station-years' data have been obtained on seven varieties in the State. The highest average yield has been made by Quivira with Tenmarq and Kanred next in order.

Thirteen varieties were grown at the two stations in Oklahoma reporting data in 1938. The averages for 1938, together with the long-time average (1931-1938), are shown in table 10. Kawvale, Quivira, and Turkey selection (C.I. 10016) had the highest average yield in 1938 with Fulcaster, Blackhull, and Early Blackhull the lowest. For the 21 station-year average for the State, Tenmarq, Quivira, and Kawvale rank the highest and Early Blackhull the lowest. It is hard to understand the popularity of Early Blackhull in view of the poor yield record this variety makes in variety tests.

In Kansas 12 varieties were grown uniformly at each of the three stations (table 11). Chiefkan, Oro x Tenmarq (C. I. 11673), and Kanred x Marquis (C. I. 11589) had the highest average yields with Turkey and Early Blackhull the lowest. For the 1931-38 average Cheyenne continues to rank first, followed by Blackhull and Tenmarq.

Twelve varieties were grown uniformly at three stations in Nebraska (table 12). The varieties having the best averages were Kawvale x Tenmarq (C. I. 11669), Chiefkan, and Oro x Tenmarq (C. I. 11673). For the 1931-38 average Cheyenne ranks first with Tenmarq and Turkey selection (C. I. 10016) second and third, respectively. For the period 1933-38 Cheyenne ranks first, followed by Tenmarq and Nebred.

In 1938 three Minnesota stations reported yields. These yields are averaged and presented in table 13. For the current year the highest yield was made by Minhardi x Marquis (C. I. 11657) with Minturki second. For the 1937-38 average Minard x Minhardi (C. I. 8888) and Minhardi x Marquis (C.I.11657) rank first with Minturki third.

At the three Montana stations reporting yields in 1938, Yogo ranked highest followed by Minturki and Minard x Minhardi (C. I. 8888) (table 14). At the bottom of the list will be found Karmont and Nebred. Although Nebred gives a very good performance in the central district, it seems to be absolutely out of place for the northern area, particularly in Montana. For the period 1931-38, four varieties are compared. In this case Yogo has the highest average.

Table 9. - Average yield in bushels per acre of winter wheat varieties grown in plot tests in Texas in 1938, and weighted averages for 1931-38

Variety	C. I. No.	Average yield in bushels				
		1938 3 stations	1938 4 stations	Rank	1931-38 14 station-years	Rank
Chiefkan	11754	24.6	20.6	1	---	--
Kawvale x Tenmarq	11669	23.7	---	--	---	--
Oro x Tenmarq	11673	23.3	---	--	---	--
Tenmarq	6936	22.0	19.1	2	25.4	2
Blackhull	6251	21.3	18.3	3	22.7	5
Quivira	8886	21.2	18.0	4	25.6	1
Denton	8265	21.0	17.9	5	22.6	6
Kawvale	8180	20.6	17.8	6	23.3	4
Kanred	5146	20.5	17.7	7	23.6	3
Early Blackhull	8856	19.6	---	--	---	--
Kharkof	1442	19.0	16.8	8	21.2	7

Table 10. - Average yield in bushels per acre of winter wheat varieties grown in plot tests in Oklahoma in 1938, and weighted averages for 1931-38

Variety	C. I. No.	Average yield in bushels		Rank
		1938 2 stations	1931-38 21 station-years	
Kawvale	8180	38.7	27.1	3
Quivira	8886	38.2	27.2	2
Turkey sel.	10016	33.2	---	--
Tenmarq	6936	33.1	27.4	1
Chiefkan	11754	32.3	---	--
Kanred	5146	31.0	26.3	6
Sibley No. 62	11523	30.4	---	--
Kharkof	1442	30.3	26.8	4
Denton	8265	30.2	25.4	7
Cheyenne	8885	29.5	26.6	5
Fulcaster	6471	26.6	---	--
Blackhull	6251	20.9	---	---
Early Blackhull	8856	20.1	23.9	8

Table 11. - Average yield in bushels per acre of winter wheat varieties grown in plot tests in Kansas in 1938, and weighted averages for 1931-38

Variety	C. I. No.	Average yield in bushels		Rank
		1938 3 stations	1931-38 19 station-years	
Chiefkan	11754	21.1	---	--
Oro x Tenmarq	11673	20.3	---	--
Kanred x Marquis	11589	19.1	---	--
Tenmarq	6936	18.6	29.3	3
Kanred	5146	16.3	---	--
Blackhull	6251	15.3	29.9	2
Cheyenne	8885	14.7	30.2	1
Kharkof	1442	14.5	---	--
Turkey	1558	14.2	27.7	6
Nebred	10094	14.0	---	--
Oro	8220	13.8	27.9	5
Early Blackhull	8856	13.7	28.8	4

Table 12. - Average yield in bushels per acre of winter wheat varieties grown in plot tests in Nebraska in 1938, and weighted averages for 1931-38 and 1933-38

Variety	C. I. No.	Average yield in bushels				
		1938 3 stations	1931-38 18 station-years	Rank	1933-38 13 station-years	Rank
Kawvale x Tenmarq	11669	20.8	---	--	---	--
Chiefkan	11754	19.9	---	--	---	--
Oro x Tenmarq	11673	18.6	---	--	---	--
Cheyenne sel.	11666	17.9	---	--	---	--
Cheyenne	8885	17.8	26.5	1	25.5	1
Nebred	10094	17.3	---	--	24.8	3
Turkey sel.	10016	17.2	24.9	3	24.2	4
Nebr. No. 60	6250	16.8	24.1	7	23.2	8
Kharkof	1442	16.6	24.7	5	23.6	6
Tenmarq	6936	16.3	25.4	2	24.9	2
Blackhull	6251	16.3	24.8	4	24.2	4
Oro	8220	14.9	24.3	6	23.4	7

Table 13. - Average yield in bushels per acre of winter wheat varieties grown in plot tests in Minnesota in 1938, and weighted averages for 1937-38

Variety	C. I. No.	Average yield in bushels		Rank
		1938 3 stations	1937-38 5 station-years	
Minhardi x Marquis	11657	25.1	23.3	1
Minturki	6155	23.1	22.5	3
Minard x Minhardi	8888	22.4	23.3	1
Minturki x Marquis	11502	21.6	21.8	4
Minturki x Marquis	(Minn.2552)	21.3	21.4	5
Minturki x Marquis	11501	19.3	20.7	6

Table 14. - Average yield in bushels per acre of winter wheat varieties grown in plot tests at Montana in 1938, and weighted averages for the period 1931-38

Variety	C. I. No.	Average yield in bushels		Rank
		1938 3 stations	1931-38 20 station-years	
Yogo	8033	40.0	34.2	1
Minturki	6155	39.7	31.1	3
Minard x Minhardi	8888	37.4	---	--
Newturk	6935	37.3	30.0	4
Kharkof	1442	37.2	31.6	2
Karmont	6700	37.0	---	--
Nebred	10094	35.1	---	--

SUMMARY OF AGRONOMIC DATA

The agronomic data other than yield have been summarized for each district in tables 15 to 17. In each case the data are averaged for as many varieties and from as many stations as possible. The number of stations entering the average is shown at the top of each column.

For the southern district the data are presented in table 15. It will be seen that Early Blackhull was very much earlier than any other variety, followed by Quivira and the two hybrid strains, Oro x Tenmarq, and Kawvale x Tenmarq. Chiefkan had an average date of heading two days earlier than Blackhull and one day earlier than Tenmarq. Early Blackhull had the earliest average ripening date but in this case the spread was not as wide as in the case of date of heading. Kawvale x Tenmarq (C. I. 11669), Kawvale, and Denton had the lowest average leaf rust readings. It should be pointed out that the hybrid strain had a lower reading than either of its parents. Chiefkan seems to be more resistant to leaf rust than does Blackhull, while Kanred, Kharkof, and Blackhull showed the highest averages. Chiefkan and Denton were the tallest of any of the varieties grown uniformly. Average test weights were all below 60 pounds per bushel. The highest averages were for Chiefkan, Kawvale x Tenmarq, Early Blackhull, Blackhull, and Oro x Tenmarq. Kharkof and Kawvale had the lightest test weights. The low test weight of Kawvale is a bit surprising since this variety carries resistance to leaf rust.

In the central district (table 16) Oro x Tenmarq and Kawvale x Tenmarq headed the earliest, followed by Chiefkan and Blackhull. In this district Chiefkan was only one day earlier than Blackhull, and Tenmarq was slightly later than these two wheats. Lodging or straw breaking was rather heavy for Blackhull and Chiefkan, a condition pointed out in the discussion of data from several stations. Kawvale x Tenmarq showed the lowest leaf rust infection, followed by Oro x Tenmarq and Chiefkan. Again Chiefkan had a lower leaf rust reading than did Blackhull. In the case of stem rust no variety was particularly resistant, Blackhull having the lowest average infection and Cheyenne the highest. Chiefkan was the tallest of the varieties grown uniformly in this district. Test weights per bushel were reported from 7 stations and Chiefkan, Kawvale x Tenmarq, and Blackhull had the highest averages. All test weights were very low due no doubt to the heavy rust infections.

Winter-killing was reported from two stations in the northern district (table 17), with Minard x Minhardi (C. I. 8888) proving to be the most hardy. As to date of heading, Nebred and Minturki x Marquis (C. I. 11502) were the earliest. Lodging was reported from two stations with Yogo having the highest average. Minard x Minhardi (C. I. 8888) had the stiffest straw. Nebred showed the lowest average infection for stem rust based on the average of two stations, although it was next to the highest for leaf rust. Kernel plumpness and texture were reported from three stations but no great differences were shown. Test weights were all fairly high at the five stations reporting for this district, with Minard x Minhardi (C. I. 8888) having the highest average.

Table 15. - Summary of agronomic data other than yield for winter wheat varieties grown at the cooperating stations in the southern district in 1938

Variety	C.I. No.	Average				
		Date		Leaf rust	Height	Test weight per bushel
		Headed	Ripe			
No. of stations		3	3	3	3	4
				(Pct.)	(In.)	(Lbs.)
Kharkof	1442	May 8	June 8	66.3	35.7	54.6
Tenmarq	6936	May 4	June 4	40.7	37.3	55.6
Blackhull	6251	May 5	June 6	63.7	36.7	57.8
Quivira	8886	Apr. 28	June 3	21.0	35.7	55.8
Early Blackhull	8856	Apr. 17	May 30	48.0	33.7	57.8
Chiefkan	11754	May 3	June 5	32.7	39.7	59.0
Oro x Tenmarq	11673	Apr. 29	June 4	20.7	36.3	57.8
Kawvale x Tenmarq	11669	Apr. 29	June 4	10.0	36.0	58.5
Denton	8265	May 5	June 6	13.7	39.7	56.5
Kawvale	8180	May 4	June 5	12.0	38.0	54.8
Kanred	5146	May 5	June 5	66.7	37.7	55.8

Table 16. - Summary of agronomic data other than yield for winter wheat varieties grown at the cooperating stations in the central district in 1938

Variety	C. I. No.	Average							
		Date		Lodging	Leaf rust	Stem rust	Hgt.	No. of culms per acre	Test wgt. per bu.
		Headed	Ripe						
No. of stations		7	6	3	5	3	7	2	7
				(Pct.)	(Pct.)	(Pct.)	(In.)	(1000)	(Lbs.)
Kharkof	1442	May 28	July 2	1.3	43.2	30.7	34.7	1769	55.9
Tenmarq	6936	26	June 30	2.3	26.2	30.7	34.6	1645	55.0
Blackhull	6251	25	June 30	30.7	49.2	11.7	35.1	1819	56.9
Oro	8220	28	July 2	0.3	55.6	29.3	34.2	1814	55.5
Cheyenne	8885	27	July 2	0.7	59.0	35.3	33.6	1779	55.5
Chiefkan	11754	24	June 30	18.3	21.8	19.0	37.0	1672	57.7
Oro x Tenmarq	11673	23	June 30	4.3	15.0	16.0	33.9	1618	56.7
Kawvale x Tenmarq	11669	23	June 29	1.3	8.6	19.7	32.5	1974	57.3
Kanred	5146	28	July 2	4.7	41.5	19.7	34.2	1770	54.9
Nebred	10094	27	June 30	6.3	67.8	24.7	31.9	1919	55.9

Table 17. - Summary of agronomic data other than yield for winter wheat varieties grown at the cooperating stations in the northern district in 1938

Variety	C. I. No.	Winter survival	Average								
			Date		Hgt.	Lodging	Stem rust	Leaf rust	Kernel plumpness	Kernel texture	Test weight per bushel
			Headed	Ripe							
Number of stations		2	5	5	3	2	2	2	3	3	5
		(Pct.)	June	July	(In.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Lbs.)
Kharkof	1442	84.0	21	28	37.7	77.5	37.0	87.0	83.0	72.0	59.3
Minturki	6155	89.0	21	27	39.0	72.0	32.5	92.0	89.3	70.0	59.7
Yogo	8033	88.0	22	28	41.3	86.0	33.0	83.5	90.0	82.5	60.2
Karmont	6700	88.0	21	28	37.0	85.0	---	---	---	---	60.2
Minturki x Marquis	11502	92.5	19	27	43.0	66.0	40.0	86.0	90.7	76.3	60.5
Minard x Minhardi	8888	94.0	21	28	38.7	35.5	56.0	97.5	81.0	80.0	61.0
Nebred	10094	86.5	19	25	33.3	61.5	13.0	93.0	87.0	77.0	59.9

SUMMARY OF PLOT DATA

The crop harvested in 1938 was subjected to an unusual number of hazards, some of the more damaging being drought, hot winds, spring freezes, leaf rust, stem rust, Septoria, hail, grasshoppers, and lodging.

Leaf-rust infection appeared early in the season and rapidly developed into one of the most severe epidemics ever observed.

Early, leaf-rust-resistant wheats proved to be the highest yielding at the stations in the southern district. Kawvale x Tenmarq (C. I. 11669) and Oro x Tenmarq (C. I. 11673) made very good records at all stations where grown.

In the central district Oro x Tenmarq (C. I. 11673), Kawvale x Tenmarq (C. I. 11669), and Chiefkan gave the highest average yields.

In the northern district Yogo continued to give the highest average yield, although some of the newer hybrids showed promise, especially in Minnesota.

Chiefkan again yielded well at most stations in the central and southern districts. This variety seems to be considerably more resistant to leaf rust than is Blackhull.

The straw of all Blackhull wheats seemed to be a little weaker than usual which resulted in considerable lodging in these varieties, both in tests and on farms.

Nebred, a new variety from Nebraska, failed to make a very impressive record in the central district due in part to susceptibility to leaf rust. Although fairly hardy, this variety seems unadapted in the northern area.

The need of resistance to both leaf and stem rust was again emphasized. Although some leaf-rust resistance is available in several new hybrid wheats, they are probably too winter-tender to be safe, except in the southern district, and possibly the southern part of the central district.

No changes were made in the lists of uniform varieties but a number of changes are contemplated in the near future.

UNIFORM YIELD NURSERY

In the fall of 1937 the uniform yield nursery was seeded at the same 11 stations in the central and southern districts as in 1936. In addition to these 11 stations two new ones were added, namely, Chillicothe, Texas, and Fort Lewis, Hesperus, Colo. The nursery again was limited to 30 varieties and strains, each seeded in three, rod-row plots. The number of plots of each variety at a station varied from three to five. In table 18 the varieties making up the 1938 nursery, together with State and C. I. numbers, are shown.

A comparison of the 1938 list with that of 1937 will show a number of changes in the nursery. Six strains which seemed to be lacking in agronomic value and which were not needed for ecological studies were replaced by newer selections. As soon as a strain is shown to be lacking in some important character it is dropped from the nursery, although it still may be continued at individual stations. The strains having the best performance in the nursery are advanced to plot trials.

Table 18. - Varieties of winter wheat grown in the uniform yield nursery, 1938

Variety	C. I. No.	State No.
Kharkof	1442	
Blackhull	6251	
Nebraska No. 60	6250	
Early Blackhull	8856	
Turkey sel.	10083	Okla. No. 1
Turkey sel.	10016	Nebr. 1069
Turkey sel.	10094	Nebr. 1063
Sibley No. 62	11523	Okla.
Kanred x Marquis	11589	Kans. No. 2690
Turkey sel.	11576	Nebr. No. 1082
Turkey sel.	11577	Nebr. No. 1081
Oro x Fulhard	11579	Nebr. No. 1083
Kawvale x Tenmarq	11669	Nebr. No. 1086
Akron Sel.	11660	Akron sel. No. 7
Penquite Sel.	11745	Okla.
Minturki x Blackhull	11671	Nebr. No. 1089
Cheyenne sel.	11666	Nebr. No. 1087
Kanred x Marquis	11746	Akron sel. No. 46
Turkey x Marquis	11747	Akron sel. No. 49
Oro x Tenmarq	11672	Kans. No. 2728
Oro x Tenmarq	11673	Kans. No. 2729
Kawvale x Tenmarq	11750	Kans. No. 2727
Blackhull sel.	11737	Nebr. No. 1093
Tenmarq x Minturki	11580	Nebr. No. 1094
Kanred x (Hope - Hard Federation)	11843	Akron No. 537
Early Blackhull Hybrid	11846	H. C. No. 366
Tenmarq x Nebr. No. 28	11847	Woodward 1094
Turkey sel.	11734	Nebr. No. 1095
Kanred x Blackhull	11844	Nebr. No. 1098
Minturki x Blackhull	11815	Nebr. No. 1099

DATA OBTAINED

In table 19 are presented the data from the 13 nurseries. The 30 varieties were grown in all of these nurseries except at Hesperus, Colo., for which station it was impossible to supply seed of two of the newer strains. For each station the varieties are listed in order of the 1938 yields. The average yields and ranks for the 7-year period (1932-1938) and the 2-year period (1937-1938) are given wherever possible. A percentage of Kharkof (C. I. 1442) is also shown for each variety so that comparisons may be made between varieties grown for varying lengths of time. Data other than yield are given when the character concerned seemed to be related to yield or when the data showed differences believed to be of interest.

At Denton both leaf and stem rust infections were very heavy. On the most resistant variety 13 percent of leaf rust developed and on the more susceptible ones nearly 100 percent. Undoubtedly leaf rust had considerable influence on yield as those varieties with the least rust infection ranked the highest. Some lodging was present, especially in Blackhull and Oro x Tenmarq (C. I. 11672). The highest yields were made by Oro x Tenmarq and Kawvale x Tenmarq hybrids. These strains not only carried some resistance to rust but also were early. Without exception the lowest-yielding varieties were Turkey type wheats which are not adapted to this station. For the 6-year period Early Blackhull and Turkey selection (C. I. 10083) have the highest average yields. For the average of the last two years Kawvale x Tenmarq (C. I. 11750), Oro x Tenmarq (C. I. 11673), and Kawvale x Tenmarq (C.I.11669) rank the highest for yield.

Yields are reported for the first time from Chillicothe, Texas. At this station the leaf rust infection was particularly heavy and considerable stem rust was present. The varieties differed considerably for date of heading but all of them ripened at the same time with the exception of Early Blackhull. The highest yields were made by Kanred x Blackhull (C. I. 11844), Tenmarq x Nebraska No. 28, and Oro x Tenmarq (C. I. 11673). Early Blackhull gave the lowest average yield.

Yields were obtained at Amarillo for the second time since the cooperation started. The varieties having the best yield record for 1938 were Oro x Fulhard (C. I. 11579), Oro x Tenmarq (C. I. 11672), Blackhull, and Sibley No. 62. Based on the 2-year average (1937-38), Oro x Fulhard (C. I. 11579), Blackhull, Sibley No. 62, and Kawvale x Tenmarq (C. I. 11669) have the best records for yield with Early Blackhull the poorest.

From Stillwater data on date of ripening, height, and test weight were reported in addition to yields. Based on the 1938 yields the best varieties were Oro x Tenmarq (C. I. 11672), Kawvale x Tenmarq (C. I. 11669), and Oro x Tenmarq (C. I. 11673). Akron selection and several Turkey type wheats gave the lowest yields. For the 7-year period Turkey selection (C. I. 10083), a Stillwater production, has the best average yield. For this same period Nebred ranks second and Blackhull third for yield. Based on the record for the last two years Kawvale x Tenmarq (C. I. 11669), and the two Oro x Tenmarq selections have the highest yields, with Cheyenne selection and Nebraska No. 60 the lowest.

At Woodward the crop was very good, ranging from 23.5 to 50.6 bushels per acre. Here the earlier, more leaf rust resistant wheats seemed to have an advantage. Considerable lodging was noted, particularly among wheats related to Blackhull. The highest yields were made by the two Kawvale x Tenmarq selections, followed by Tenmarq x Minturki and Oro x Tenmarq. At the bottom of the list may be found Early Blackhull, Minturki x Blackhull (C. I. 11671), and Nebraska No. 60. For the 7-year period Turkey selection (C. I. 10016) and Nebred have the best records of the varieties grown for that period. For the two-year average yield the two Kawvale x Tenmarq strains and Tenmarq x Minturki (C. I. 11580) rank the highest. The two-year average follows very closely the 1938 yields since these yields were so high.

Tenmarq x Nebraska No. 28 and two Kawvale x Tenmarq strains gave the highest yields at Manhattan. Leaf rust was fairly heavy on all except the Oro x Tenmarq and Kawvale x Tenmarq selections. For the long-time average Nebred and Turkey selection (C. I. 10016) have the best average yields of any of the varieties grown throughout the period. On the basis of the 1937-38 average the highest ranking varieties are Oro x Tenmarq (C. I. 11672), Kawvale x Tenmarq (C. I. 11750), and Oro x Tenmarq (C. I. 11673).

Good rust readings were obtained on the varieties in the nursery at Hays, Kans. Two Kawvale x Tenmarq strains showed considerable resistance to leaf rust, while one or two varieties developed very little stem rust. A frost early in May caused considerable injury, especially to the earlier strains such as Early Blackhull hybrid, Oro x Tenmarq (C. I. 11672), and Tenmarq x Minturki (C. I. 11580). Kawvale x Tenmarq selection (C. I. Nos. 11750 and 11669) gave the highest yields, followed by Kanred x Marquis (C.I.11746) and Tenmarq x Nebraska No. 28 (C.I.11847). Kanred x Hope-Hard Federation and Early Blackhull gave the lowest yields. For a 6-year period Blackhull ranks first with Turkey selection (C. I.10083) second. On the basis of the 1937-38 yields the varieties rank very much the same as in the case of the 1938 yields.

At Akron data were recorded for time of maturity, height, test weight, and yield. The yields were a bit erratic due to poor stands which were caused by slow germination in the fall. The two Kawvale x Tenmarq lines gave the highest yields, followed by Tenmarq x Minturki (C. I. 11580) and Kanred x Marquis (C. I. 11589). It will be noticed that the earlier, less winter hardy wheats gave the best yields since winter-killing was not a factor. For the 5-year period Nebred, Blackhull, and Early Blackhull have the highest averages. For the last two years Kawvale x Tenmarq (C. I. 11750), Oro x Tenmarq (C.I.11673 and Kawvale x Tenmarq (C. I. 11669) have given the best yields.

At Fort Collins the usual readings on lodgings were obtained. Akron selection, Kanred x Marquis (C. I. 11589), Tenmarq x Nebraska No. 28 (C.I.11847), and Oro x Tenmarq (C. I. 11673) had the lowest lodging percents. Akron selection, Early Blackhull, and Early Blackhull hybrid gave yields of 63 or more bushels per acre. The lowest-yielding variety was Nebraska No. 60 with a yield of 45.3 bushels per acre. For a 6-year period Nebred and Turkey selection (C. I. 10083) have yielded the highest. On the basis of the 1937-38 averages Kanred x Marquis (C. I. 11589) ranks first, followed by Akron selection, Cheyenne selection, and Turkey selection (C. I. 11577).

Yields were reported from the Fort Lewis Experiment Station, Hesperus, Colo., for the first time. Only 28 varieties were grown at this station due to inability to obtain seed. The highest average yields were made by Turkey selection (C. I. Nos. 11734 and 11577), followed by Nebraska No. 60 and Minturki x Blackhull (C. I. 11815). The earlier strains made relatively poor showings at this station.

At Lincoln there was some winter-killing among the more tender varieties and considerable lodging or straw breaking in strains related to Blackhull. No variety was free of stem rust and a heavy epidemic of leaf rust was present on all varieties except those having either Kawvale or Tenmarq as a parent. The highest-yielding varieties were Oro x Tenmarq (C. I. 11673), Kawvale x Tenmarq (C. I. 11669), Kawvale x Tenmarq (C. I. 11750), and Oro x Tenmarq (C. I. 11672). For the 7-year average Early Blackhull, Blackhull, and Nebred have the highest average yields. Based on the 1937-38 average Kawvale x Tenmarq (C. I. 11669) ranks first, followed by Kawvale x Tenmarq (C. I. 11750) and Oro x Tenmarq (C. I. 11673).

Test weights were unusually low at North Platte with only a few of the varieties having weights of 56 pounds per bushel or better. At this station the earlier varieties such as Kawvale x Tenmarq, Early Blackhull, and Oro x Tenmarq gave the highest yields. For a 4-year average Turkey selection (C. I. 10016) and Kharkof have made the best yields. It is impossible to obtain a 1937-38 average, but for the years 1936 and 1938 Kawvale x Tenmarq (C. I. 11669), Akron selection, and Early Blackhull have the best records.

From Alliance data were reported on winter survival, dates of heading and ripening, height, and test weight. Cheyenne selection, Akron selection, and Sibley No. 62 gave the highest average yields. In this case the earlier varieties were intermediate for yield. On the basis of a 4-year average Nebred and Turkey selection (C. I. 10016) have the best records.

STANDARD ERRORS

Standard errors were calculated for each nursery as outlined on page 34 of this report. In table 20 will be found the number of plots, average yields, and standard errors for the uniform nursery grown at each station.

Table 19. - Agronomic and other data for the uniform winter-wheat varieties grown in replicated nursery plots in cooperative experiments at 13 stations in the winter-wheat area, 1938

Denton, Texas

(Four plots)

Variety	C.I. No.	Date Headed	Date Ripe	Hgt. (in.)	Percent Rust Leaf Apr. 12	Percent Rust Leaf Final	Percent Rust Stem	Lodging (Pct.)	Av. acre yield (Bu.)	Yield Av. 1932-1934 & 1936-1938	Rank	Yield Av. 1937-1938	Rank	No. of years grown	Percentage of Kharkof for same years
Oro x Tenmarq	11673	4/23	5/28	45	5	25	21	0	38.2	---		36.0	2	2	240.0
Kawvale x Tenmarq	11750	4/25	5/28	44	1	13	16	0	37.2	---		36.3	1	2	242.0
Kawvale x Tenmarq	11669	4/23	5/28	41	1	26	21	1	35.8	---		34.2	3	3	161.6
Oro x Tenmarq	11672	4/23	5/28	43	15	26	20	13	35.8	---		33.6	4	2	224.0
Tenmarq x Nebr. No. 28	11847	4/23	5/28	47	20	70	18	0	35.3	---		---		1	330.0
Early Blackhull	8856	4/11	5/18	43	40	55	E	0	33.7	31.3	1	32.6	5	6	151.9
Tenmarq x Minturki	11580	4/24	5/29	43	38	69	26	4	32.3	---		31.5	6	2	210.0
Kanred x Marquis	11589	4/25	5/28	45	20	60	24	0	31.4	---		30.1	7	4	157.8
Early Blackhull Hybrid	11846	4/18	5/30	46	20	76	50	0	27.1	---		---		1	255.7
Kanred x Hope-Hard Federation	11843	4/20	5/28	39	50	97	T	0	25.3	---		---		1	238.7
Kanred x Blackhull	11844	4/26	5/30	43	45	91	30	3	22.4	---		---		1	211.3
Minturki x Blackhull	11815	4/26	5/30	45	40	88	18	3	21.7	---		---		1	204.7
Minturki x Blackhull	11671	4/28	5/29	46	43	76	10	6	18.8	---		22.6	9	3	123.2
Kanred x Marquis	11746	4/27	6/ 1	40	28	73	36	0	18.3	---		20.8	12	3	117.9
Penquite sel.	11745	4/29	5/31	41	63	98	69	1	17.8	---		20.5	13	3	112.1
Blackhull selection	11737	4/30	5/31	39	55	92	11	3	16.8	---		23.1	8	2	154.0
Turkey selection	10083	5/ 1	6/ 1	40	48	97	44	8	16.1	26.1	2	22.0	10	6	126.7
Sibley No. 62	11523	4/30	5/31	39	48	89	56	1	16.0			21.2	11	4	130.4
Blackhull	6251	4/28	5/30	40	63	89	13	13	14.0	22.9	3	19.0	17	6	111.2
Turkey selection	10016	4/28	5/31	38	53	95	56	1	13.4	21.0	4	20.5	13	6	101.9
Akron selection	11660	4/28	5/29	37	73	99	64	0	12.8	---		18.0	20	3	109.8
Nebred	10094	4/30	6/ 1	36	70	98	49	0	12.4	20.3	6	19.3	16	6	98.5
Turkey x Marquis	11747	4/29	6/ 1	38	70	98	50	0	12.2	---		20.2	15	3	112.5
Oro x Fulhard	11579	4/29	5/30	37	60	98	41	4	12.0	---		18.9	18	3	108.0
Kharkof	1442	5/ 1	6/ 2	40	50	98	50	0	10.6	20.6	5	15.0	23	6	100.0
Turkey selection	11734	4/30	6/ 2	37	70	98	44	0	10.3	---		---		1	97.2
Cheyenne selection	11666	4/30	6/ 1	35	80	98	55	0	10.2	---		18.1	19	3	108.0
Nebraska No. 60	6250	5/ 1	6/ 3	40	70	98	44	0	10.1	19.2	7	15.0	23	6	93.2
Turkey selection	11577	4/30	6/ 1	35	73	98	44	0	7.0	---		16.3	22	3	101.3
Turkey selection	11576	5/ 2	6/ 2	35	78	98	43	0	6.4	---		16.6	21	4	88.7

Standard error of a difference, 2.22 bu.; standard error of a mean, 1.57 bu.; or 7.70 percent.

Table 19. - (Continued)

Chillicothe, Texas

(Four plots; seeded Nov. 19, 1937)

Variety	C. I. No.	Date Headed	Date Ripe	Height	Rust Leaf	Rust Stem	Average acre yield
				(In.)	(Pct.)	(Pct.)	(Bu.)
Kanred x Blackhull	11844	4/22	6/1	28	75	5	22.4
Tenmarq x Nebr. No. 28	11847	4/22	6/1	27	65	T	22.1
Oro x Tenmarq	11673	4/22	6/1	26	15	T	20.0
Blackhull selection	11737	4/28	6/1	27	25	T	19.7
Akron selection	11660	4/26	6/1	27	65	T	19.5
Kawvale x Tenmarq	11669	4/22	6/1	25	5	T	19.4
Blackhull	6251	4/28	6/1	25	60	T	19.2
Turkey selection	11734	4/28	6/1	27	50	T	19.1
Tenmarq x Minturki	11580	4/28	6/1	26	35	T	18.9
Kanred x Marquis	11746	4/28	6/1	26	10	2	18.8
Turkey x Marquis	11747	4/28	6/1	27	65	2	18.4
Nebred	10094	4/28	6/1	25	65	T	18.2
Minturki x Blackhull	11671	5/ 1	6/1	31	25	T	18.2
Cheyenne selection	11666	4/28	6/1	26	75	T	18.1
Penquite selection	11745	4/28	6/1	27	65	T	17.8
Kanred x Marquis	11589	4/26	6/1	23	35	15	17.6
Kanred x Hope-Hard Federation	11843	4/22	6/1	25	65	20	17.6
Turkey selection	10016	4/26	6/1	27	55	T	17.2
Turkey selection	10083	5/ 1	6/1	21	65	T	17.2
Turkey selection	11577	5/ 1	6/1	26	65	T	17.2
Early Blackhull Hybrid	11846	4/22	6/1	28	45	15	17.2
Sibley No. 62	11523	4/28	6/1	26	60	5	16.8
Turkey selection	11576	5/ 1	6/1	25	65	T	16.8
Oro x Tenmarq	11672	4/22	6/1	22	15	T	16.8
Kawvale x Tenmarq	11750	4/22	6/1	26	15	15	16.7
Nebraska No. 60	6250	5/ 1	6/1	28	65	T	16.4
Oro x Fulhard	11579	4/28	6/1	24	65	5	16.4
Kharkof	1442	5/ 1	6/1	26	65	T	16.2
Minturki x Blackhull	11815	4/28	6/1	27	45	T	15.9
Early Blackhull	8856	4/13	5/24	28	30	T	14.4

Standard error of a difference, 1.84 bu.; standard error of a mean, 1.30 bu.; or 7.18 percent.

Table 19. - (Continued)

Amarillo, Texas

(Three plots)

Variety	C. I. No.	Average acre yield	Yield		Percentage of Kharkof for same years
			Average 1937-1938	Rank	
		(Bu.)			
Oro x Fulhard	11579	29.6	18.7	1	133.6
Oro x Tenmarq	11672	25.6	15.7	8	112.1
Blackhull	6251	24.1	17.2	2	122.9
Sibley No. 62	11523	24.1	16.9	3	120.7
Kawvale x Tenmarq	11669	23.9	16.6	4	118.6
Turkey selection	11577	23.7	14.2	14	101.4
Blackhull selection	11737	23.2	15.9	6	113.6
Turkey selection	10083	22.4	14.1	15	100.7
Akron selection	11660	22.4	15.0	10	107.1
Tenmarq x Minturki	11580	22.3	16.0	5	114.3
Turkey selection	10016	22.1	15.4	9	110.0
Kanred x Marquis	11746	21.8	14.1	15	100.7
Nebred	10094	21.7	13.4	20	95.7
Kanred x Marquis	11589	21.7	14.3	12	102.1
Cheyenne selection	11666	21.4	14.3	12	102.1
Oro x Tenmarq	11673	21.3	15.8	7	112.9
Turkey selection	11576	20.8	12.7	21	90.7
Kawvale x Tenmarq	11750	20.8	14.5	11	103.6
Minturki x Blackhull	11671	20.6	13.7	18	97.9
Nebraska No. 60	6250	20.5	12.7	21	90.7
Kharkof	1442	20.0	14.0	17	100.0
Penquite selection	11745	20.0	13.5	19	96.4
Turkey selection	11734	19.7	---		98.5
Early Blackhull Hybrid	11846	19.7	---		98.5
Early Blackhull	8856	19.6	11.5	24	82.1
Kanred x Blackhull	11844	19.2	---		96.0
Turkey x Marquis	11747	19.0	13.0	23	92.9
Kanred x Hope-Hard Federation	11843	17.7	---		88.5
Tenmarq x Nebr. No. 28	11847	17.2	---		86.0
Minturki x Blackhull	11815	17.1	---		85.5

Standard error of a difference, 2.64 bu.; standard error of a mean, 1.87 bu.; or 8.74 percent.

Table 19. - (Continued)

Stillwater, Okla.

(Four plots)

Variety	C. I. No.	Date Ripe	Height	Test weight	Av. acre yield	Average 1932-1938	Rank	Average 1937-1938	Rank	No. of years grown	Percentage of Kharkof for same years
		June	(In.)	(Lbs.)	(Bu.)						
Oro x Tenmarq	11672	14	39.0	57.0	31.8	---	--	33.6	2	2	133.3
Kawvale x Tenmarq	11669	11	37.0	58.0	30.5	---	--	33.7	1	4	119.4
Oro x Tenmarq	11673	12	38.5	56.0	30.3	---	--	32.1	3	2	127.4
Kawvale x Tenmarq	11750	11	37.5	55.0	27.9	---	--	31.3	4	2	124.2
Tenmarq x Nebr. No. 28	11847	12	39.5	61.0	26.2	---	--	---	--	1	151.4
Early Blackhull Hybrid	11846	11	39.5	56.0	26.1	---	--	---	--	1	150.9
Tenmarq x Minturki	11580	15	38.0	57.0	25.1	---	--	30.6	5	2	121.4
Kanred x Marquis	11589	11	39.5	58.0	23.8	---	--	29.2	6	5	112.9
Kanred x Marquis	11746	15	40.0	57.0	22.7	---	--	26.5	10	3	100.0
Kanred x Blackhull	11844	12	37.5	58.5	22.2	---	--	---	--	1	128.3
Minturki x Blackhull	11815	12	39.5	59.5	21.7	---	--	---	--	1	125.4
Turkey selection	10083	14	37.0	57.0	21.5	31.0	1	28.1	8	7	107.6
Early Blackhull	8856	3	35.5	58.0	21.2	27.5	7	28.6	7	7	95.5
Penquite selection	11745	13	39.0	60.0	19.3	---	--	25.8	12	3	94.1
Kanred x Hope-Hard Federation	11843	10	35.0	55.0	18.6	---	--	---	--	1	107.5
Sibley No. 62	11523	14	38.0	57.0	17.4	---	--	24.9	15	5	110.5
Kharkof	1442	15	37.5	57.0	17.3	28.8	4	25.2	13	7	100.0
Blackhull	6251	12	39.0	60.0	16.9	29.2	3	27.7	9	7	101.4
Turkey x Marquis	11747	13	36.5	58.0	16.4	---	--	23.8	17	3	93.4
Turkey selection	10016	13	36.5	57.5	16.2	27.6	6	23.9	16	7	95.8
Oro x Fulhard	11579	11	35.5	57.0	15.7	---	--	26.4	11	4	93.3
Blackhull selection	11737	10	38.0	58.0	15.6	---	--	25.2	13	2	100.0
Turkey selection	11734	12	36.0	59.0	15.2	---	--	---	--	1	87.9
Minturki x Blackhull	11671	11	39.5	56.0	13.9	---	--	23.0	20	3	93.0
Nebred	10094	12	35.0	58.0	13.5	29.4	2	23.8	17	7	102.1
Nebr. No. 60	6250	13	38.0	58.0	12.4	28.4	5	22.0	23	7	98.6
Turkey selection	11576	12	36.0	57.5	12.4	---	--	22.4	22	5	89.5
Turkey selection	11577	14	35.5	57.0	11.8	---	--	23.7	19	4	92.1
Cheyenne selection	11666	12	34.5	---	10.4	---	--	22.0	23	3	87.5
Akron selection	11660	9	36.5	---	7.6	---	--	22.5	21	4	80.2

Standard error of a difference, 2.14 bu.; standard error of a mean, 1.51 bu., or 7.86 percent.

Table 19. - (Continued)

Woodward, Okla.

(Four plots; seeded Oct. 8, 1937; emerged Oct. 17, 1937)

Variety	C. I. No.	Date Headed	Date Ripe	Height	Leaf rust	Lodging	Test weight	Av. acre yield	Yield: Average 1932-1938	Yield: Rank	Yield: Average 1937-1938	Yield: Rank	No. of years grown	Percentage of Kharkof for same years
		June		(In.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)						
Kawvale x Tenmarq	11669	5-3	10	39	11	38	59	50.6	---	--	34.7	1	4	157.4
Kawvale x Tenmarq	11750	5-2	10	42	6	18	57	48.3	---	--	31.9	2	2	182.3
Tenmarq x Minturki	11580	5-5	12	42	39	0	58	48.1	---	--	31.3	3	2	178.9
Oro x Tenmarq	11672	5-2	11	42	43	10	57	41.0	---	--	26.8	6	2	153.1
Kanred x Blackhull	11844	5-4	12	42	61	T	57	39.6	---	--	---		1	155.9
Tenmarq x Nebr. No. 28	11847	5-9	12	45	53	1	60	39.3	---	--	---		1	154.7
Kanred x Marquis	11589	5-3	9	42	61	1	58	38.9	---	--	27.1	5	5	125.6
Cheyenne selection	11666	5-8	11	40	74	3	57	36.9	---	--	24.7	8	3	124.0
Akron sel.	11660	5-5	12	42	80	1	58	36.5	---	--	28.3	4	4	132.4
Turkey selection	10016	5-4	11	41	66	0	58	36.2	22.3	1	24.6	10	7	107.7
Penquite	11745	5-9	12	42	42	2	59	36.0	---	--	26.6	7	3	125.0
Kanred x Marquis	11746	5-8	13	35	40	3	58	35.9	---	--	22.2	16	3	109.4
Oro x Tenmarq	11673	5-2	11	41	29	11	57	35.8	---	--	24.8	9	2	141.7
Early Blackhull hybrid	11846	5-6	12	44	59	10	55	35.7	---	--	---		1	140.6
Turkey x Marquis	11747	5-6	13	41	74	1	57	35.2	---	--	22.9	14	3	115.1
Turkey selection	11734	5-13	12	42	78	0	58	34.8	---	--	---		1	137.0
Nebred	10094	5-9	11	40	74	6	57	33.7	21.9	2	22.5	15	7	105.8
Sibley No. 62	11523	5-11	12	41	63	7	55	32.6	---	--	22.2	16	5	104.5
Turkey selection	11577	5-11	13	39	79	9	55	31.7	---	--	23.4	12	4	117.6
Minturki x Blackhull	11815	5-12	14	44	69	1	58	31.5	---	--	---		1	124.0
Oro x Fulhard	11579	5-9	10	41	79	1	57	30.9	---	--	23.7	11	4	126.7
Turkey selection	11576	5-12	12	39	78	6	56	28.8	---	--	21.6	18	5	111.4
Blackhull	6251	5-9	12	43	69	30	58	27.9	20.9	4	19.2	21	7	101.0
Blackhullselection	11737	5-8	11	41	75	65	56	27.2	---	--	23.1	13	2	132.0
Turkey selection	10083	5-11	12	41	70	9	55	26.9	21.7	3	19.5	20	7	104.8
Kanred x Hope-Hard Fed.	11843	5- 2	11	39	78	1	55	26.0	---	--	---	--	1	102.4
Kharkof	1442	5-16	14	41	64	4	56	25.4	20.7	5	17.5	23	7	100.0
Early Blackhull	8856	4-25	7	37	75	40	60	25.0	19.9	6	21.3	19	7	96.1
Minturki x Blackhull	11671	5-11	11	43	63	0	56	24.6	---	--	18.2	22	3	101.0
Nebraska No. 60	6250	5-17	14	39	70	9	58	23.5	19.9	6	17.1	24	7	96.1

Standard error of a difference, 2.94 bu.; standard error of a mean 2.08 bu., or 6.10 percent.

Table 19. - (Continued)

Hays, Kans.

(Three plots)

Variety	C. I. No.	Date Headed	Date Ripe	Height	Rust Leaf	Rust Stem	Frost injury	Av. acre yield	Average 1932-34 & 1936-38	Rank	Average 1937-1938	Rank	No. of years grown	Percentage of Kharkof for years grown
		(May)	(June)	(In.)	(Pct.)	(Pct.)	(Pct.)	(Bu.)						
Kawvale x Tenmarq	11750	11	18	35	5	40	24	37.9	---	--	35.0	1	2	130.6
Kawvale x Tenmarq	11669	10	18	33	0	40	30	31.2	---	--	30.4	2	3	119.6
Kanred x Marquis	11746	14	22	39	20	75	12	27.2	---	--	28.3	3	3	107.7
Tenmarq x Nebr. No. 28	11847	12	20	38	35	50	50	24.8	---	--	---	-	1	112.7
Minturki x Blackhull	11815	15	23	39	57	30	4	24.4	---	--	---	-	1	110.9
Sibley No. 62	11523	16	20	38	58	10	1	24.0	---	--	28.0	4	4	125.1
Turkey selection	10083	15	20	37	58	10	8	23.5	26.4	2	27.3	7	6	110.5
Kanred x Marquis	11589	11	18	36	43	50	5	23.1	---	--	27.6	6	4	122.9
Oro x Tenmarq	11672	11	18	37	25	25	35	22.2	---	--	27.9	5	2	104.1
Oro x Tenmarq	11673	11	18	35	25	75	30	22.2	---	--	27.1	8	2	101.1
Kharkof	1442	17	23	39	30	70	1	22.0	23.9	5	26.8	10	6	100.0
Penquite selection	11745	14	20	38	43	50	10	22.0	---	--	23.9	19	3	92.3
Tenmarq x Minturki	11580	11	20	36	35	90	35	21.9	---	--	26.2	11	2	97.8
Blackhull	6251	13	19	38	77	40	17	21.6	27.5	1	26.9	9	6	115.1
Nebr. No. 60	6250	17	23	38	65	75	4	20.6	23.0	7	25.0	13	6	96.2
Cheyenne selection	11666	16	23	35	100	75	17	20.5	---	--	25.0	13	3	105.2
Turkey selection	11577	15	23	36	100	50	15	20.4	---	--	24.0	18	3	100.4
Nebred	10094	15	22	36	88	75	20	20.3	25.4	3	24.5	16	6	106.3
Minturki x Blackhull	11671	16	23	39	30	10	T	19.9	---	--	25.2	12	3	98.9
Blackhull selection	11737	14	20	36	100	15	18	19.5	---	--	24.6	15	2	91.8
Early Blackhull Hybrid	11846	12	20	37	40	50	40	19.1	---	--	---	--	1	86.8
Turkey selection	11734	15	23	37	88	75	7	18.8	---	--	---	--	1	85.5
Turkey selection	10016	12	20	34	100	75	30	17.6	23.8	6	21.2	22	6	99.6
Akron selection	11660	13	21	36	88	50	6	17.6	---	--	24.3	17	3	102.2
Turkey selection	11576	15	22	37	100	75	15	16.9	---	--	21.5	21	4	107.5
Turkey x Marquis	11747	13	22	36	100	50	18	16.0	---	--	20.0	23	3	86.3
Oro x Fulhard	11579	13	22	36	65	50	8	15.6	---	--	22.8	20	3	97.0
Kanred x Blackhull	11844	11	18	37	88	75	12	15.6	---	--	---	--	1	70.9
Kanred x Hope-Hard Fed.	11843	8	16	32	88	25	25	13.9	---	--	---	--	1	63.2
Early Blackhull	8856	2	15	30	100	10	80	8.9	24.6	4	18.5	24	6	102.9

Standard error of a difference, 1.50 bu.; standard error of a mean, 1.06 bu., or 5.05 percent.

Table 19. - (Continued)

Manhattan, Kans.

(Three plots)

Variety	C. I. No.	Date Headed	Date Ripe	Height	Leaf rust	Kernel plumpness	Test weight	Av. acre yield	Average 1932-1938	Rank	Average 1937-1938	Rank	No. of years grown	Percentage of Kharkof for same years
		(May)	(June)	(In.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)						
Tenmarq x Nebr. No. 28	11847	16	25	38	62	89	59.9	29.1	---	--	---	--	1	145.5
Kawvale x Tenmarq	11750	13	24	32	12	89	57.4	28.3	---	--	35.6	2	2	144.7
Kawvale x Tenmarq	11669	13	20	30	37	95	61.1	27.6	---	--	34.0	4	4	137.0
Oro x Tenmarq	11672	12	24	34	17	89	59.1	27.1	---	--	36.6	1	2	148.8
Kanred x Marquis	11589	14	20	33	30	92	59.3	26.1	---	--	34.0	4	5	124.2
Oro x Tenmarq	11673	12	20	34	17	92	59.8	25.0	---	--	34.7	3	2	141.1
Tenmarq x Minturki	11580	15	23	32	45	85	56.6	23.2	---	--	32.7	6	2	132.9
Kanred x Marquis	11746	17	25	34	23	86	56.2	22.6	---	--	27.2	15	3	111.7
Penquite selection	11745	16	25	35	67	87	57.1	22.3	---	--	25.5	20	3	101.1
Turkey selection	10016	15	20	31	73	88	57.9	21.6	34.6	2	30.7	7	7	125.4
Early Blackhull (Natural Cross)	11846	15	23	35	42	86	56.2	20.8	---		---		1	104.0
Turkey selection	10083	17	24	37	82	85	54.3	20.3	32.4	3	28.8	11	7	117.4
Nebred	10094	18	20	32	82	86	56.9	20.0	36.4	1	29.5	10	7	131.9
Kharkof	1442	19	26	34	83	84	54.1	20.0	27.6	7	24.6	21	7	100.0
Turkey selection	11576	17	23	34	82	84	54.6	19.5	---	--	28.1	14	5	119.1
Cheyenne sel. (Nebr.1087)	11666	18	21	32	77	85	55.6	18.5	---	--	30.1	8	3	120.5
Nebr. No. 60	6250	20	26	35	82	85	54.7	18.0	28.9	6	23.1	23	7	104.7
Turkey selection	11577	17	23	33	83	85	53.6	17.7	---	--	29.7	9	4	118.9
Sibley No. 62	11523	18	24	35	68	84	53.2	1717	---	--	26.4	17	5	117.2
Blackhull selection	11737	16	20	36	85	84	55.9	17.6	---	--	28.8	11	2	117.1
Blackhull	6251	17	24	35	83	86	56.0	16.8	31.8	5	26.2	18	7	115.2
Oro x Fulhard	11579	16	20	34	73	84	55.2	16.7	---	--	24.6	21	4	111.7
Kanred x Blackhull	11844	15	24	33	78	85	54.4	16.6	---	--	---	--	1	83.0
Turkey selection	11734	17	24	34	78	84	53.7	15.6	---	--	---	--	1	78.0
Akron sel. (Mutant)	11660	17	20	35	87	83	53.6	14.9	---	--	26.8	16	4	102.6
Minturki x Blackhull	11815	17	25	35	78	84	54.7	14.2	---	--	---	--	1	71.0
Early Blackhull	8856	7	20	32	82	85	58.0	14.0	32.0	4	28.5	13	7	115.9
Turkey x Marquis	11747	16	20	31	82	81	53.2	13.9	---	--	21.9	24	3	89.4
Kanred x Hope-Hard Fed.	11843	15	22	31	88	76	49.5	9.6	---	--	---	--	1	48.0
Minturki x Blackhull	11671	19	23	35	75	77	49.2	8.4	---	--	25.9	19	3	108.7

Standard error of a difference, 2.36 bu.; standard error of a mean, 1.67 bu., or 8.56 percent.

Table 19. - (Continued)

Akron, Colo.

(Three plots)

Variety	C. I. No.	Date Headed	Date Ripe	Height	Test weight	Av. acre yield	Average 1933-34 & 1936-38	Rank	Average 1937-1938	Rank	No. of years grown	Percentage of Kharkof for years grown
				(In.)	(Lbs.)	(Bu.)						
Kawvale x Tenmarq	11750	5/27	7/2	34	56.0	31.4	---		26.9	1	2	133.2
Kawvale x Tenmarq	11669	5/26	7/2	33	58.3	28.0	---		24.2	3	3	123.7
Tenmarq x Minturki	11580	5/29	7/3	36	52.2	27.2	---		22.9	8	2	113.4
Kanred x Marquis	11589	5/27	7/2	36	56.0	27.2	---		23.8	5	4	131.9
Oro x Tenmarq	11673	5/28	7/2	36	57.0	27.1	---		24.5	2	2	121.3
Akron selection	11660	5/30	7/3	36	54.5	26.1	---		23.0	6	3	113.7
Oro x Fulhard	11579	5/28	7/3	34	57.0	25.9	---		22.7	9	3	114.2
Oro x Tenmarq	11672	5/28	7/3	36	55.0	25.7	---		24.0	4	2	118.8
Cheyenne selection	11666	5/29	7/3	33	56.0	25.3	---		23.0	6	3	116.4
Early Blackhull Hybrid	11846	5/27	7/1	36	54.0	23.7	---		---		1	107.2
Early Blackhull	8856	5/21	6/30	34	58.4	23.4	18.6	3	22.3	10	5	114.8
Kanred x Hope-Hard Federation	11843	5/26	7/2	33	56.5	23.3	---		---		1	105.4
Nebred	10094	5/29	7/2	33	54.8	23.0	19.0	1	22.1	11	5	117.3
Turkey selection	11577	5/30	7/3	35	51.3	22.9	---		21.1	14	3	102.3
Turkey selection	11734	5/29	7/2	35	52.0	22.9	---		---		1	103.6
Blackhull selection	11737	5/30	7/3	37	56.0	22.8	---		21.7	12	2	107.4
Sibley No. 62	11523	5/30	7/3	36	53.5	22.7	---		21.6	13	4	102.7
Minhardi x Blackhull	11815	5/28	7/3	37	53.5	22.4	---		---		1	101.4
Turkey selection	10016	5/27	7/2	33	54.3	22.3	17.4	4	20.4	15	5	107.4
Kharkof	1442	5/30	7/3	35	53.0	22.1	16.2	5	20.2	18	5	100.0
Tenmarq x Nebr. No. 28	11847	5/28	7/3	36	57.5	21.7	---		---		1	98.2
Turkey selection	10083	5/29	7/2	35	53.0	21.1	15.9	6	20.3	17	5	98.1
Blackhull	6251	5/28	7/3	36	54.3	20.8	18.9	2	20.4	15	5	116.7
Minturki x Blackhull	11671	5/30	7/2	36	54.0	20.6	---		19.0	19	3	96.8
Turkey selection	11576	5/28	7/2	34	51.2	20.1	---		19.0	19	4	100.0
Kanred x Blackhull	11844	5/27	7/2	37	53.0	19.9	---		---		1	90.0
Nebraska No. 60	6250	6/1	7/4	34	55.0	18.0	15.1	7	17.2	23	5	93.2
Turkey x Marquis	11747	5/28	7/2	34	53.5	17.8			18.2	22	3	92.7
Penquite selection	11745	5/30	7/2	37	54.0	16.3	---		16.8	24	3	90.0
Kanred x Marquis	11746	5/29	7/3	35	51.5	13.8	---		18.4	21	3	97.3

Standard error of a difference, 4.51 bu.; standard error of a mean, 3.19 bu., or 13.93 percent.

Table 19. - (Continued)

Fort Collins, Colo.

(Five plots; seeded Sept 10, 1937; emerged Oct. 10, 1937)

Variety	C. I. No.	Date Headed	Date Ripe	Height	Stem rust	Lodging	Av. acre yield	Average 1933-1938	Rank	Average 1937-1938	Rank	No. of years grown	Percentage of Kharkof for years grown
		(July)		(In.)	(Pct.)	(Pct.)	(Bu.)						
Akron selection	11660	6/3	18	49	7	22	64.3	---		60.2	2	4	107.3
Early Blackhull	8856	5/28	13	48	3	67	63.5	45.1	6	52.5	21	6	94.7
Early Blackhull Hybrid	11846	5/3	16	49	6	37	63.1	---		---		1	110.7
Kanred x Marquis	11589	6/2	16	48	8	21	62.9	---		62.0	1	5	115.0
Kawvale x Tenmarq	11669	5/30	15	46	T	31	62.3	---		58.9	5	4	110.7
Minturki x Blackhull	11815	6/3	18	51	3	51	61.8	---		---		1	108.4
Turkey selection	11577	6/3	19	51	8	81	60.6	---		59.7	4	4	112.1
Blackhull	6251	6/1	16	49	8	76	60.0	47.9	3	57.0	9	6	100.6
Cheyenne selection	11666	6/3	19	46	5	74	59.1	---		59.9	3	3	103.0
Minturki x Blackhull	11671	6/4	17	51	8	47	58.9	---		58.2	6	3	101.4
Turkey selection	11734	6/2	19	48	8	87	58.9	---		---		1	103.3
Penquite selection	11745	6/4	17	48	5	82	58.8	---		57.8	7	3	97.2
Tenmarq x Minturki	11580	6/3	18	48	5	38	58.2	---		56.6	12	2	101.4
Kanred x Blackhull	11844	5/30	18	48	13	69	58.1	---		---		1	101.9
Kharkof	1442	6/4	17	49	5	73	57.0	47.6	4	55.8	16	6	100.0
Kanred x Marquis	11746	6/3	18	48	5	74	56.9	---		56.7	11	3	99.3
Kanred x Hope-Hard Fed.	11843	5/30	16	46	5	50	56.7	---		---		1	99.5
Turkey selection	10016	5/31	16	48	5	71	55.8	47.5	5	56.8	10	6	99.8
Oro x Tenmarq	11672	5/30	16	47	5	43	55.7	---		50.6	23	2	90.7
Oro x Tenmarq	11673	5/31	17	47	8	30	55.6	---		54.4	18	2	97.5
Tenmarq x Nebr. No. 28	11847	6/1	17	49	5	24	55.5	---		---		1	97.4
Turkey x Marquis	11747	6/1	17	48	8	59	54.9	---		57.2	8	3	104.8
Sibley No. 62	11523	6/5	20	48	8	82	54.4	---		55.8	16	5	104.1
Turkey selection	10083	6/4	18	49	4	91	53.4	49.4	2	54.1	19	6	103.8
Oro x Fulhard	11579	6/2	20	48	4	71	53.4	---		56.4	13	4	102.0
Nebred	10094	6/2	18	45	3	64	52.3	51.5	1	56.3	14	6	108.2
Turkey selection	11576	6/3	18	47	5	72	51.7	---		56.0	15	5	105.7
Kawvale x Tenmarq	11750	6/1	17	47	2	35	49.5	---		54.0	20	2	96.8
Blackhull selection	11737	6/4	18	50	8	90	49.3	---		52.5	21	2	94.1
Nebraska No. 60	6250	6/7	22	48	15	68	45.3	44.5	7	48.9	24	6	93.5

Standard error of a difference, 4.98 bu.; standard error of a mean, 3.52 bu., or 6.19 percent.

Table 19. - (Continued)

Fort Lewis Experiment Station, Hesperus, Colo.

(Three plots)

Variety	C. I. No.	Date		Height	Av. acre yield	Percentage of Kharkof
		Headed (June)	Ripe (Aug.)	(In.)	(Bu.)	
Turkey selection	11734	22	4	45	50.3	154.8
Turkey selection	11577	20	3	44	47.2	145.2
Nebraska No. 60	6250	24	6	43	46.6	143.4
Minturki x Blackhull	11815	19	5	43	45.8	140.9
Turkey x Marquis	11747	20	3	41	42.4	130.5
Nebred	10094	23	5	38	39.8	122.5
Cheyenne selection	11666	22	4	42	39.7	122.2
Kanred x Blackhull	11844	21	4	43	38.2	117.5
Akron selection	11660	22	7	43	36.8	113.2
Oro x Fulhard	11579	24	7	43	36.7	112.9
Kanred x Marquis	11746	19	5	44	35.6	109.5
Blackhull	6251	19	5	42	35.2	108.3
Turkey selection	11576	22	6	43	34.3	105.5
Sibley No. 62	11523	21	4	45	33.9	104.3
Turkey selection	10016	23	8	41	33.0	101.5
Kharkof	1442	25	3	41	32.5	100.0
Turkey selection	10083	23	4	42	31.8	97.8
Blackhull selection	11737	22	7	43	31.3	96.3
Minturki x Blackhull	11671	21	6	45	31.1	95.7
Oro x Tenmarq	11673	18	2	42	30.9	95.1
Penquite selection	11745	21	5	42	26.3	80.9
Kanred x Hope-Hard Federation	11843	22	5	40	26.2	80.6
Kawvale x Tenmarq	11669	20	4	41	24.7	76.0
Kanred x Marquis	11589	20	3	40	24.5	75.4
Oro x Tenmarq	11672	20	2	41	24.3	74.8
Tenmarq x Minturki	11580	22	3	39	23.4	72.0
Kawvale x Tenmarq	11750	19	4	42	23.3	71.7
Early Blackhull	8856	22	1	40	22.7	69.8

Standard error of a difference, 7.48 bu.; standard error of a mean, 5.29 bu., or 15.74 percent.

Table 19. - (Continued)

(Four plots; seeded Sept. 14, 1938)

Alliance, Nebr.

Variety	C. I. No.	Winter survival	Date Headed	Date Ripe	Height	Test weight per bu.	Av. acre yield	Av. 1932-34 & 1938	Rank	No. of years grown	Percentage of Kharkof for same years
		(Pct.)	(June)	(July)	(In.)	(Lbs.)	(Bu.)				
Cheyenne selection	11666	95	8	12	32.3	61.5	33.4	---		1	119.7
Akron selection	11660	90	8	13	36.0	58.0	30.7	---		1	110.0
Sibley No. 62	11523	95	11	14	35.8	61.0	29.8	---		2	112.8
Oro x Tenmarq	11672	90	5	11	35.3	60.0	29.7	---		1	106.5
Blackhull selection	11737	95	8	13	36.0	61.5	29.4	---		1	105.4
Early Blackhull Hybrid	11846	88	6	12	35.8	60.0	29.3	---		1	105.0
Tenmarq x Nebr. No. 28	11847	90	6	13	36.8	61.5	29.1	---		1	104.3
Tenmarq x Minturki	11580	88	7	13	36.0	60.0	28.9	---		1	103.6
Minturki x Blackhull	11671	83	9	14	38.3	60.0	28.9	---		1	103.6
Oro x Tenmarq	11673	90	5	11	34.0	60.0	28.7	---		1	102.9
Kawvale x Tenmarq	11669	90	4	11	33.8	59.5	28.4	---		1	101.8
Kawvale x Tenmarq	11750	95	7	12	34.3	59.0	28.4	---		1	101.8
Oro x Fulhard	11579	93	7	13	33.8	61.0	28.2	---		1	101.1
Turkey selection	11576	95	7	12	32.5	60.0	28.1	---		2	111.6
Turkey selection	10016	95	7	12	31.3	61.0	28.0	18.8	3	4	99.5
Nebred	10094	90	8	13	31.5	61.0	28.0	19.3	1	4	102.1
Kanred x Blackhull	11844	90	7	13	32.8	60.0	28.0	---		1	100.4
Kharkof	1442	93	9	13	34.5	60.0	27.9	18.9	2	4	100.0
Kanred x Marquis	11589	85	6	12	36.8	60.0	27.8	---		2	123.2
Turkey selection	11734	90	8	13	33.0	60.5	27.8	---		1	99.6
Blackhull	6251	90	8	13	35.3	61.0	27.4	17.1	5	4	90.5
Turkey selection	11577	95	8	13	33.8	59.0	27.3	---		1	97.8
Turkey selection	10083	90	8	13	36.8	61.0	27.1	18.3	4	4	96.8
Kanred x Marquis	11746	95	7	12	32.0	59.0	27.1	---		1	97.1
Minturki x Blackhull	11815	90	8	13	35.0	61.5	27.1	---		1	97.1
Penquite selection	11745	88	8	13	37.3	61.0	26.7	---		1	95.7
Nebraska No. 60	6250	95	8	14	33.5	60.0	26.2	16.2	7	4	85.7
Kanred x Hope-Hard Federation	11843	85	7	13	35.8	57.0	25.7	---		1	92.1
Early Blackhull	8856	90	3	10	35.8	61.0	25.5	16.7	6	4	88.4
Turkey x Marquis	11747	95	7	13	34.3	60.0	24.9	---		1	89.2

Standard error of a difference, 1.89 bu.,; standard error of a mean, 1.34 bu., or 4.77 percent.

Table 19. - (Continued)

North Platte, Nebr.

(Four plots; seeded Sept.16,1937)

Variety	C. I. No.	Date Headed	Height	Plumpness	Test weight	Av. acre yield	Average 1933,35, 36 & 1938	Rank	Average 1936 & 1938	Rank	No. of years grown	Percentage of Kharkof for years grown
		(May)	(In.)	(Pct.)	(Lbs.)	(Bu.)						
Kawvale x Tenmarq	11669	21	33	75.0	56.0	23.8	---	--	28.2	1	3	140.7
Early Blackhull	8856	20	36	70.0	57.5	22.0	25.2	6	22.0	3	4	95.8
Oro x Tenmarq	11672	24	36	55.0	49.0	21.3	---	--	---	--	1	162.6
Kawvale x Tenmarq	11750	24	35	50.0	52.0	19.7	---	--	---	--	1	150.4
Oro x Tenmarq	11673	24	35	55.0	51.5	18.8	---	--	---	--	1	143.5
Tenmarq x Minturki	11580	25	35	55.0	53.0	18.1	---	--	---	--	1	138.2
Akron selection	11660	26	36	55.0	53.0	17.7	---	--	23.6	2	3	122.5
Kanred x Blackhull	11844	25	35	50.0	49.5	17.4	---	--	---	--	1	132.8
Tenmarq x Nebr. No. 28	11847	26	38	70.0	57.5	17.4	---	--	---	--	1	132.8
Oro x Fulhard	11579	28	36	70.0	56.5	16.6	---	--	21.0	7	3	111.0
Blackhull selection	11737	26	36	60.0	55.0	16.6	---	--	---	--	1	126.7
Cheyenne selection	11666	27	32	55.0	55.0	16.5	---	--	20.4	10	2	120.0
Turkey selection	11734	27	34	55.0	53.0	16.4	---	--	---	--	1	125.2
Turkey selection	10016	25	34	50.0	52.5	16.3	26.8	1	20.6	8	4	101.9
Kanred x Marquis	11589	25	36	55.0	52.0	16.2	---	--	22.0	3	3	119.1
Kanred x Marquis	11746	27	36	50.0	53.0	15.7	---	--	18.6	15	2	109.4
Early Blackhull Hybrid	11846	25	37	45.0	51.0	15.7	---	--	---	--	1	119.8
Turkey selection	11577	27	36	50.0	52.0	15.6	---	--	20.6	8	3	112.7
Nebred	10094	27	34	55.0	55.5	15.4	25.6	5	21.3	5	4	97.3
Nebr. No. 60	6250	30	36	65.0	56.0	15.0	25.9	4	19.2	14	4	98.5
Penquite selection	11745	28	38	60.0	55.5	14.7	---	--	21.2	6	2	124.7
Turkey selection	11576	26	36	45.0	49.0	14.5	---	--	19.9	11	3	102.5
Turkey x Marquis	11747	27	36	55.0	52.5	14.1	---	--	19.9	11	2	117.1
Kharkof	1442	30	36	60.0	53.0	13.1	26.3	2	17.0	18	4	100.0
Minturki x Blackhull	11815	28	38	40.0	49.5	12.8	---	--	---	--	1	97.7
Minturki x Blackhull	11671	29	39	45.0	49.5	12.6	---	--	18.4	17	2	108.2
Kanred x Hope-Hard Fed.	11843	25	34	50.0	50.5	12.6	---	--	---	--	1	96.2
Blackhull	6251	26	38	50.0	50.5	11.8	23.2	7	15.3	19	4	88.2
Turkey selection	10083	28	36	40.0	47.5	11.4	26.1	3	19.7	13	4	99.2
Sibley No. 62	11523	28	36	45.0	49.5	11.3	---	--	18.6	15	3	102.5

Standard error of a difference, 2.47 bu.; standard error of a mean, 1.75 bu., or 10.94 percent.

Table 19. - (Continued)

Lincoln, Nebr.

(Five plots; seeded Oct.22,1937;
emerged Oct.30, 1937)

Variety	C. I. No.	Winter survival	Date Headed	Date Ripe	Height	Lodging	Rust Leaf	Rust Stem	Plumpness	Test wgt. per bu.	Av. acre yield	Av. 1932-1938	Rank	Av. 1937-1938	Rank	No. of yrs. grown	Percent Kharkof for same years
		(Pct.)			(In.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)						
Oro x Tenmarq	11673	98	6/1	7/2	41	0	25	25	75	53.0	20.9	--		18.0	3	2	140.6
Kawvale x Tenmarq	11669	83	5/29	7/1	41	3	15	30	75	54.0	20.6	--		20.3	1	4	141.8
Kawvale x Tenmarq	11750	99	6/2	7/2	40	0	T	35	65	52.0	19.1	--		19.5	2	2	152.3
Oro x Tenmarq	11672	98	6/2	7/2	40	0	20	25	80	53.5	18.5	--		16.3	4	2	127.3
Tenmarq x Minturki	11580	100	6/2	7/3	40	2	30	55	55	51.5	14.7	--		14.8	7	2	115.6
Turkey selection	10016	100	6/2	7/3	38	1	75	45	65	53.5	14.0	22.5	4	13.4	15	7	116.6
Turkey selection	11576	100	6/3	7/4	39	0	65	50	80	55.5	13.8	--		14.2	10	5	102.7
Sibley No. 62	11523	98	6/6	7/5	39	0	55	60	65	54.0	13.7	--		13.8	11	5	86.6
Cheyenne selection	11666	100	6/2	7/2	37	0	80	50	85	54.5	13.7	--		16.1	5	3	105.1
Kanred x Marquis	11589	84	6/3	7/3	40	0	40	65	70	53.0	13.4	--		15.0	6	5	100.0
Nebred	10094	100	6/3	7/2	38	0	85	40	80	55.0	13.3	23.4	3	14.8	7	7	121.2
Tenmarq x Nebr.No.28	11847	83	6/5	7/5	39	0	55	65	85	57.0	13.3	--		14.8		1	133.0
Turkey selection	10083	98	6/7	7/5	38	0	50	50	50	53.5	12.0	18.8	6	14.7	9	7	97.4
Kanred x Marquis	11746	99	6/4	7/4	38	2	75	60	75	54.0	11.2	--		13.1	16	3	99.0
Early Blackhull Hybrid	11846	73	6/4	7/4	39	20	35	35	50	49.5	11.2	--				1	112.0
Minturki x Blackhull	11815	100	6/5	7/5	42	10	75	60	75	55.5	10.8	--		---		1	108.0
Kanred x Blackhull	11844	100	6/2	7/3	40	13	75	50	70	53.0	10.8	--		---		1	108.0
Penquite selection	11745	86	6/5	7/5	41	0	50	70	60	53.0	10.4	--		12.2	21	3	91.3
Turkey selection	11577	100	6/4	7/3	38	0	90	65	70	53.5	10.2	--		13.1	16	4	96.2
Early Blackhull	8856	69	5/29	6/30	38	17	75	15	65	54.5	10.1	24.2	1	13.7	12	7	125.4
Kharkof	1442	99	6/6	7/5	37	0	70	40	70	55.0	10.0	19.3	5	12.8	18	7	100.0
Blackhull	6251	91	6/4	7/4	38	1	75	50	70	54.5	10.0	24.1	2	13.7	12	7	124.9
Kanred x Hope-Hard Fed.	11843	83	6/3	7/5	36	2	65	65	75	53.5	9.3	--				1	93.0
Oro x Fulhard	11579	99	6/4	7/3	39	20	85	45	50	50.5	8.8	--		12.4	20	4	92.3
Akron selection	11660	100	6/4	7/3	38	20	90	50	55	51.0	8.8	--		12.5	19	4	118.3
Turkey x Marquis	11747	100	6/4	7/3	37	4	75	50	55	51.0	8.7	--		11.2	23	3	93.8
Nebraska No. 60	6250	100	6/7	7/5	38	0	75	60	60	52.5	7.9	18.7	7	12.1	22	7	96.9
Blackhull selection	11737	99	6/5	7/4	39	41	80	40	60	53.5	6.8	--		13.6	14	2	106.3
Minturki x Blackhull	11671	93	6/6	7/4	41	43	70	50	55	52.0	6.5	--		11.0	24	3	91.3
Turkey selection	11734	100	6/7	7/4	36	0	85	65	90	56.0	5.6	--		---		1	56.0

Standard error of a difference, 1.29 bu.; standard error of a mean, 0.91 bu., or 7.65 percent.

Table 20. - Number of plots, average yield, and standard errors of a difference and of the mean for the uniform yield nursery at each cooperating station in 1938

Station	No. of plots	Average yield of varieties (Bu.)	Standard error of a difference (Bu.)	Standard error of a mean in Bushels	Standard error of a mean in Percent
Texas:					
Denton	4	20.4	2.22	1.57	7.70
Chillicothe	4	18.1	1.84	1.30	7.18
Amarillo	3	21.4	2.64	1.87	8.74
Oklahoma					
Stillwater	4	19.2	2.14	1.51	7.86
Woodward	4	34.1	2.94	2.08	6.10
Kansas					
Manhattan	3	19.5	2.36	1.67	8.56
Hays	3	21.0	1.50	1.06	5.05
Colorado					
Akron	3	22.9	4.51	3.19	13.93
Ft. Collins	5	56.9	4.98	3.52	6.19
Hesperus	3	33.6	7.48	5.29	15.74
Nebraska					
Lincoln	5	11.9	1.29	0.91	7.65
North Platte	4	16.0	2.47	1.75	10.94
Alliance	4	28.1	1.89	1.34	4.77

SUMMARY OF NURSERY YIELDS

The yields of the 30 varieties of winter wheat grown at 13 stations are summarized in table 21. In this table the varieties are listed in the order of the 13-station average yield. These averages are of interest only in so far as they show the general adaptation of the variety. A more detailed study is made possible, as the varieties also have been averaged and ranked by States. Thus it is possible to study the performance of any particular strain in more detail.

Kawvale x Tenmarq (C. I. 11669) had the highest average yield for 1938. The performance of this variety was fairly consistent in that it ranked first or second in all States except Colorado. In Colorado it ranked eleventh, due for the most part to a poor showing at Ft. Lewis. Kawvale x Tenmarq (C.I.11750) had a record nearly as good as the above, although again a very poor yield was made at Ft. Lewis. These two selections were well up for yield last year. The strains ranking third and fourth were Oro x Tenmarq selections. The next two were Tenmarq x Minturki (C. I. 11580), and Tenmarq x Nebr. No. 28 (C. I. 11847). All of these earlier wheats were consistently good in performance in all States except Colorado. Twenty strains gave yields higher than Blackhull, all but 5 were higher than Kharkof, and Nebraska No. 60 was at the bottom of the list.

Twenty-four varieties have been grown in the nursery for the two-year period 1937 and 1938, at 9 stations. These data are presented in table 22 where the yields are averaged by States and the varieties are listed in order of yield at all stations. At the top of the list will be found two Kawvale x Tenmarq and two Oro x Tenmarq strains. These four selections ranked high in all States except Colorado. Twelve wheats yielded better than Blackhull and all were higher than Nebraska No. 60. Nebred yielded less on the average than did Blackhull. The advantage of earliness and leaf rust resistance during the last two years is clearly demonstrated by the performance of the new hybrid strains. Whether or not these wheats will continue to be satisfactory in years of winter-killing remains to be demonstrated.

Table 21. - Summary of average yields of the 30 winter wheat varieties grown as uniform yield nurseries at 13 stations in the hard red winter-wheat region. 1938.

Variety	C. I. No.	Texas Bushels per acre					Oklahoma Bushels per acre				Kansas Bushels per acre				Nebraska Bushels per acre					Colorado Bushels per acre					Av. bushels per acre 13 stations
		Denton	Chillicothe	Amarillo	Av.	Rank	Stillwater	Woodward	Av.	Rank	Manhattan	Hays	Av.	Rank	Lincoln	North Platte	Alliance	Av.	Rank	Akron	Fort Collins	Fort Lewis	Av.	Rank	
Kanvale x Tenmarq	11669	35.8	19.4	23.9	26.4	2	30.5	50.6	40.6	1	27.6	31.2	29.4	2	20.6	23.8	28.4	24.3	1	28.0	62.3	24.7	38.3	11	31.3
Kanvale x Tenmarq	11750	37.2	16.7	20.8	24.9	4	27.9	48.3	38.1	2	28.3	37.9	33.1	1	19.1	19.7	28.4	22.4	4	31.4	49.5	23.3	34.7	26	29.9
Oro x Tenmarq	11672	35.8	16.8	25.6	26.1	3	31.8	41.0	36.4	4	27.1	22.2	24.7	5	18.5	21.3	29.7	23.2	2	25.7	55.7	24.3	35.2	25	28.9
Oro x Tenmarq	11673	38.2	20.0	21.3	26.5	5	30.3	35.8	33.1	5	25.0	22.2	23.6	7	20.9	18.8	28.7	22.8	3	27.1	55.6	30.9	37.9	13	28.8
Tenmarq x Minturki	11580	32.3	18.9	22.3	24.5	6	25.1	48.1	36.6	3	23.2	21.9	22.6	8	14.7	18.1	28.9	20.6	6	27.2	58.2	23.4	36.3	20	27.9
Tenmarq x Nebraska No. 28	11847	35.3	22.1	17.2	24.9	4	26.2	39.3	32.8	6	29.1	24.8	27.0	3	13.3	17.4	29.1	19.9	7	21.7	55.5	----	----	---	27.6 1/
Kanred x Marquis	11589	31.4	17.6	21.7	23.6	7	23.8	38.9	31.4	7	26.1	23.1	24.6	6	13.4	16.2	27.8	19.1	10	27.2	62.9	24.5	38.2	12	27.3
Early Blackhull Hybrid	11846	27.1	17.2	19.7	21.3	9	26.1	35.7	30.9	8	20.8	19.1	20.0	14	11.2	15.7	29.3	18.7	14	23.7	63.1	----	----	---	25.7 1/
Kanred x Blackhull	11844	22.4	22.4	19.2	21.3	9	22.2	39.6	30.9	8	16.6	15.6	16.1	26	10.8	17.4	28.0	18.7	14	19.9	58.1	38.2	38.7	6	25.4
Kanred x Marquis	11746	18.3	18.8	21.8	19.6	13	22.7	35.9	29.3	10	22.6	27.2	24.9	4	11.2	15.7	27.1	18.0	17	13.8	56.9	35.6	35.4	21	25.2
Minturki x Blackhull	11815	21.7	15.9	17.1	18.2	20	21.7	31.5	26.6	12	14.2	24.4	19.3	17	10.8	12.8	27.1	16.9	23	22.4	61.8	45.8	43.3	3	25.2
Cheyenne selection	11666	10.2	18.1	21.4	16.6	24	10.4	36.9	23.7	18	18.5	20.5	19.5	16	13.7	16.5	33.4	21.2	5	25.3	59.1	39.7	41.4	5	24.9
Akron selection	11660	12.8	19.5	22.4	18.2	20	7.6	36.5	22.1	24	14.9	17.6	16.3	24	8.8	17.7	30.7	19.1	10	26.1	64.3	36.8	42.4	4	24.3
Turkey selection	11734	10.3	19.1	19.7	16.4	26	15.2	34.8	25.0	15	15.6	18.8	17.2	23	5.6	16.4	37.8	16.6	25	22.9	58.9	50.3	44.0	1	24.3
Sibley No. 62	11523	16.0	16.8	24.1	19.0	17	17.4	32.6	25.0	15	17.7	24.0	20.9	12	13.7	11.3	39.8	18.3	16	22.7	54.4	33.9	37.0	15	24.2
Turkey selection	10016	13.4	17.2	22.1	17.6	22	16.2	36.2	26.2	13	21.6	17.6	19.6	15	14.0	16.3	28.0	19.4	8	22.3	55.8	33.0	37.0	15	24.1
Turkey selection	11577	7.0	17.2	23.7	16.0	27	11.8	31.7	21.8	25	17.7	20.4	19.1	20	10.2	15.6	27.3	17.7	19	22.9	60.6	47.2	43.6	2	24.1
Nebred	10094	12.4	18.2	21.7	17.4	23	13.5	33.7	23.6	19	20.0	20.3	20.2	13	13.3	15.4	28.0	18.9	12	23.0	52.3	39.8	38.4	9	24.0
Ponquite selection	11745	17.8	17.8	20.0	18.5	19	19.3	36.0	27.7	11	22.3	22.0	22.2	9	10.4	14.7	26.7	17.3	21	16.3	58.8	26.3	33.8	28	23.7
Oro x Fulhard	11579	12.0	16.4	29.6	19.3	14	15.7	30.9	23.3	20	16.7	15.6	16.2	25	8.8	16.6	28.2	17.9	18	25.9	53.4	36.7	38.7	6	23.6
Blackhull	6251	14.0	19.2	24.1	19.1	16	16.9	27.9	22.4	22	16.8	21.6	19.2	19	10.0	11.8	27.4	16.4	26	20.8	60.0	35.2	38.7	6	23.5
Early Blackhull	8856	33.7	14.4	19.6	22.6	8	21.2	25.0	23.1	21	14.0	8.9	11.5	30	10.1	22.0	25.5	19.2	9	23.4	63.5	22.7	36.5	19	23.4
Turkey selection	10083	16.1	17.2	22.4	18.6	18	21.5	26.9	24.2	17	20.3	23.5	21.9	10	12.0	11.4	27.1	16.8	24	21.1	53.4	31.8	35.4	21	23.4
Blackhull selection	11737	16.8	19.7	23.2	19.9	12	15.6	27.2	21.4	26	17.6	19.5	18.6	21	6.8	16.6	29.4	17.6	20	22.8	49.3	31.3	34.5	27	22.8
Kharkof	1442	10.6	16.2	20.0	15.6	29	17.3	25.4	21.4	26	20.0	22.0	21.0	11	10.0	13.1	27.9	17.0	22	22.1	57.0	32.5	37.2	14	22.6
Turkey x Marquis	11747	12.2	18.4	19.0	16.5	25	16.4	35.2	25.8	14	13.9	16.0	15.0	27	8.7	14.1	24.9	15.9	29	17.8	54.9	42.4	38.4	9	22.6
Turkey selection	11576	6.4	16.8	20.8	14.7	30	12.4	28.8	20.6	28	19.5	16.9	18.2	22	13.8	14.5	28.1	18.8	13	20.1	51.7	34.3	35.4	21	21.9
Minturki x Blackhull	11671	18.8	18.2	20.6	19.2	15	13.9	24.6	19.3	29	8.4	19.9	14.2	28	6.5	12.6	28.9	16.0	28	20.6	58.9	31.1	36.9	17	21.8
Kanred x Hope-Hard Federation	11843	25.3	17.6	17.7	20.2	11	18.6	26.0	22.3	23	9.6	13.9	11.8	29	9.3	12.6	25.7	15.9	29	23.3	56.7	26.2	35.4	21	21.7
Nebraska No. 60	6250	10.1	16.4	20.5	15.7	28	12.4	23.5	18.0	30	18.0	20.6	19.3	17	7.9	15.0	26.2	16.4	26	18.0	45.3	46.6	36.6	18	21.6
Standard error of a mean (Bu.)			1.57	1.30	1.87	0.92		1.51	2.08	1.29		1.67	1.06	0.99		0.91	1.75	1.34	0.80		3.19	3.52	5.29	2.37	0.66
Standard error of a mean (Pct.)			7.70	7.18	8.74	4.56		7.86	6.10	4.97		8.56	5.05	4.97		7.65	10.94	4.77	4.73		13.93	6.19	15.74	7.30	2.51

1/ Not grown at Fort Lewis.

Table 22. - Summary of average yields of 24 winter wheats grown in uniform yield nurseries at 9 stations in the hard red winter-wheat region. 1937-38.

Variety	C. I. No.	Texas				Oklahoma				Kansas				Nebraska		Colorado				Av. bushels per acre 9 stations
		Bushels per acre				Bushels per acre				Bushels per acre				Bushels per a.		Bushels per acre				
		Denton	Amarillo	Average	Rank	Stillwater	Woodward	Average	Rank	Manhattan	Hays	Average	Rank	Lincoln	Rank	Akron	Fort Collins	Average	Rank	
Kawvale x Tenmarq	11669	34.2	16.6	25.4	2	33.7	34.7	34.2	1	34.0	30.4	32.2	3	20.3	1	24.2	58.9	41.6	2	31.9
Kawvale x Tenmarq	11750	36.3	14.5	25.4	2	31.3	31.9	31.6	2	35.6	35.0	35.3	1	19.5	2	26.9	54.0	40.5	5	31.7
Oro x Tenmarq	11673	36.0	15.8	25.9	1	32.1	24.8	28.5	5	34.7	27.1	30.9	4	18.0	3	24.5	54.4	39.5	9	29.7
Oro x Tenmarq	11672	33.6	15.7	24.7	4	33.6	26.8	30.2	4	36.6	27.9	32.3	2	16.3	4	24.0	50.6	37.3	20	29.5
Tenmarq x Minturki	11580	31.5	16.0	23.8	5	30.6	31.3	31.0	3	32.7	26.2	29.5	6	14.8	7	22.9	56.6	39.8	7	29.2
Kanred x Marquis	11589	30.1	14.3	22.2	6	29.2	27.1	28.2	6	34.0	27.6	30.8	5	15.0	6	23.8	62.0	42.9	1	29.2
Cheyenne selection	11666	18.1	14.3	16.2	20	22.0	24.7	23.4	18	30.1	25.0	27.6	9	16.1	5	23.0	59.9	41.5	4	25.9
Sibley No. 62	11523	21.2	16.9	19.1	9	24.9	22.2	23.6	15	26.4	28.0	27.2	10	13.8	11	21.6	55.8	38.7	11	25.6
Akron selection	11660	18.0	15.0	16.5	18	22.5	28.3	25.4	8	26.8	24.3	25.6	17	12.5	19	23.0	60.2	41.6	2	25.6
Early Blackhull	8856	32.6	11.5	22.1	7	28.6	21.3	25.0	10	28.5	18.5	23.5	23	13.7	12	22.3	52.5	37.4	19	25.5
Turkey selection	10083	22.0	14.1	18.1	12	28.1	19.5	23.8	14	28.8	27.3	28.1	7	14.7	9	20.3	54.1	37.2	22	25.4
Blackhull selection	11737	23.1	15.9	19.5	8	25.2	23.1	24.2	13	28.8	24.6	26.7	13	13.6	14	21.7	52.5	37.1	23	25.4
Blackhull	6251	19.0	17.2	18.1	12	27.7	19.2	23.5	17	26.2	26.9	26.6	14	13.7	12	20.4	57.0	38.7	11	25.3
Kanred x Marquis	11746	20.8	14.1	17.5	15	26.5	22.2	24.4	11	27.2	28.3	27.8	8	13.1	16	18.4	56.7	37.6	17	25.3
Turkey selection	10016	20.5	15.4	18.0	14	23.9	24.6	24.3	12	30.7	21.2	26.0	15	13.4	15	20.4	56.8	38.6	13	25.2
Oro x Fulhard	11579	18.9	18.7	18.8	10	26.4	23.7	25.1	9	24.6	22.8	23.7	22	12.4	20	22.7	56.4	39.6	8	25.2
Nebred	10094	19.3	13.4	16.4	19	23.8	22.5	23.2	20	29.5	24.5	27.0	11	14.8	7	22.1	56.3	39.2	10	25.1
Turkey selection	11577	16.3	14.2	15.3	21	23.7	23.4	23.6	15	29.7	24.0	26.9	12	13.1	16	21.1	59.7	40.4	6	25.0
Penquite selection	11745	20.5	13.5	17.0	16	25.8	26.6	26.2	7	25.5	23.9	24.7	20	12.2	21	16.8	57.8	37.3	20	24.7
Minturki x Blackhull	11671	22.6	13.7	18.2	11	23.0	18.2	20.6	23	25.9	25.2	25.6	17	11.0	24	19.0	58.2	38.6	13	24.1
Turkey selection	11576	16.6	12.7	14.7	22	22.4	21.6	22.0	21	28.1	21.5	24.8	19	14.2	10	19.0	56.0	37.5	18	23.6
Kharkof	1142	15.0	14.0	14.5	23	25.2	17.5	21.4	22	24.6	26.8	25.7	16	12.8	18	20.2	55.8	38.0	15	23.5
Turkey x Marquis	11747	20.2	13.0	16.6	17	23.8	22.9	23.4	18	21.9	20.0	21.0	24	11.2	23	18.2	57.2	37.7	16	23.2
Nebraska No. 60	6250	15.0	12.7	13.9	24	22.0	17.1	19.6	24	23.1	25.0	24.1	21	12.1	22	17.2	48.9	33.1	24	21.5

SUMMARY OF AGRONOMIC DATA

Data for characters other than yield are averaged and presented in table 23. Since all stations did not report the same data, the number of stations entering the averages is shown at the top of each column.

Two stations reported winter-killing and at these Early Blackhull, Early Blackhull Hybrid, and Kanred x Hope-Hard Federation were the least hardy. Date of heading data show that Early Blackhull averaged 4 days earlier than any other strain. Kawvale x Tenmarq (C. I. 11669), the Oro x Tenmarq selections, and Kanred x Hope-Hard Foderation are all earlier than most of the wheats in the nursery. Ripening dates bring out the same differences, although the spread is not so great.

Average infections of leaf rust were high on all strains except Kawvale x Tenmarq (C. I. 11669 and 11750), and Oro x Tenmarq (C. I. Nos. 11672 and 11673). For stem rust Early Blackhull, Minturki x Blackhull (C. I. 11671), and the Kawvale x Tenmarq and Oro x Tenmarq lines were most resistant. Much more work needs to be done on combining resistance to rust with desirable agronomic characters.

Lodging data from four stations showed Kanred x Marquis (C. I. 11589), Tenmarq x Nebr. No. 28 (C. I. 11847), and Oro x Tenmarq (C. I. 11673) to be the most resistant. The greatest amount of lodging was present in Blackhull selection, Blackhull, Early Blackhull, Minturki x Blackhull (C. I. 11671), and Oro x Fulhard (C. I. 11579). The behavior of the Blackhull wheats as to lodging corresponds with their performance in plot tests.

Two measures of grain quality are presented - kernel plumpness and test weight per bushel. In general grain quality was associated with earliness and rust resistance. Kawvale x Tenmarq (C. I. 11669), Tenmarq x Nebr. No. 28, and Turkey sel. (C. I. 11734) had the highest average plumpness figures. For average test weight, Tenmarq x Nebr. No. 28, Early Blackhull, Kawvale x Tenmarq (C. I. 11669), and Penquite selection ranked highest. Blackhull failed to rank among the heaviest wheats for the first time. The lightest weight wheat was produced by Minturki x Blackhull (C. I. 11671), a late strain having some stem-rust resistance, but susceptible to leaf rust.

Table 23. - Summary of agronomic data other than yield for 30 varieties of winter wheat grown as uniform yield nurseries at 13 stations in the hard red winter-wheat region, 1938

Variety	C. I. No.	Average								
		Winter Survival	Date headed	Date ripe	Leaf rust	Stem rust	Hgt.	Lodging	Kernel plumpness	Test weight
Number of stations		2	11	11	6	5	12	4	3	7
		(Pct.)	May	June	(Pct.)	(Pct.)	(In.)	(Pct.)	(Pct.)	(Lbs.)
Kharkof	1442	96.0	26	28	68.3	33.2	37.5	19.3	71.3	55.4
Blackhull	6251	90.5	22	26	75.5	22.4	38.2	30.0	68.7	56.3
Nebr. No. 60	6250	97.5	26	28	75.8	39.0	37.5	19.3	70.0	56.3
Early Blackhull	8856	79.5	14	21	69.5	6.0	36.4	31.0	73.3	58.2
Turkey Sel.	10083	94.0	24	27	70.3	21.8	37.5	27.0	58.3	54.5
Turkey Sel.	10016	97.5	21	26	77.3	36.4	36.1	18.3	67.7	56.4
Nebred	10094	95.0	23	26	82.0	33.6	35.3	17.5	73.7	56.9
Sibley No. 62	11523	96.5	24	27	65.5	27.8	38.1	22.5	64.7	54.7
Kanred x Marquis	11589	84.5	21	25	44.8	32.4	37.9	5.5	72.3	56.6
Turkey Sel.	11576	97.5	24	27	81.3	34.8	36.5	19.5	69.7	54.8
Turkey Sel.	11577	97.5	24	27	85.8	33.6	36.9	22.5	68.3	54.5
Oro x Fulhard	11579	96.0	23	26	77.5	29.0	36.8	24.0	68.0	56.3
Kawvale x Tenmarq	11669	86.5	18	25	15.7	18.6	36.1	18.3	81.7	58.0
Akron Sel.	11660	95.0	22	26	84.8	34.4	37.6	10.8	64.3	54.9
Penquite Sel.	11745	87.0	23	27	60.8	39.0	38.8	21.3	69.0	57.1
Minturki x Blackhull	11671	88.0	24	26	56.5	15.8	40.3	24.0	59.0	53.8
Cheyenne Sel.	11666	97.5	23	26	84.0	37.2	35.4	19.3	75.0	56.7
Kanred x Marquis	11746	97.0	22	27	40.2	35.6	37.3	19.8	70.3	55.5
Turkey x Marquis	11747	97.5	21	26	82.3	32.0	36.7	16.0	63.7	55.0
Oro x Tenmarq	11672	94.0	19	25	24.3	15.2	37.7	16.5	74.7	55.8
Oro x Tenmarq	11673	94.0	19	25	22.7	26.0	37.9	10.3	74.0	56.3
Kawvale x Tenmarq	11750	97.0	20	25	8.7	21.6	37.4	13.3	68.0	55.5
Blackhull Sel.	11737	97.0	23	26	76.2	15.0	38.2	49.8	68.0	56.6
Tenmarq x Minturki	11580	94.0	21	26	42.2	35.4	37.6	11.0	65.0	55.5
Kanred x Hope-Hd.Fed.	11843	84.0	19	25	80.2	23.2	35.5	13.3	67.0	53.9
Early Blackhull Hybrid	11846	80.5	20	26	49.5	31.2	39.1	16.8	60.3	54.5
Tenmarq x Nebr.No.28	11847	86.5	21	26	56.7	27.8	39.5	6.3	81.3	59.2
Turkey Sel.	11734	95.0	24	27	79.5	38.6	37.0	21.8	76.3	56.0
Kanred x Blackhull	11844	95.0	20	26	78.0	34.6	38.0	21.5	68.3	55.1
Minturki x Blackhull	11815	95.0	23	27	68.7	22.4	39.6	16.3	66.3	56.0

DATA FROM THE DISEASE NURSERIES

BUNT NURSERY

For convenience copies of the data from the uniform winter wheat bunt nursery and from the varieties inoculated with pure races of bunt are included in this report. These data are presented in tables 24 and 25.

UNITED STATES DEPARTMENT OF AGRICULTURE

Bureau of Plant Industry

SUMMARY OF THE GREAT PLAINS UNIFORM WINTER WHEAT BUNT NURSERY, 1937-38

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The uniform winter-wheat bunt nursery for the Great Plains area was continued in 1937-38, in the same manner as in previous years. This report is a summary of the data obtained in 1938, together with averages for the varieties grown during different periods from 1932 to 1938.

In the fall of 1937, 50 varieties and strains of winter wheat were sown in duplicate 8-foot rows at 10 stations in the Great Plains and at Bozeman, Mont., Kearneysville, W. Va., and Arlington, Va. The nursery included varieties that had shown resistance in previous years and interesting new strains supplied by several of the cooperating stations.

Inoculum for each station was obtained from the previous year's nursery at that station by selecting bunted heads from all infected varieties. For the Kearneysville and Arlington tests, the seed was inoculated with a composite made up of inoculum from all other nurseries. In all tests the inoculum was Tilletia levis, the smooth-spored species.

Data from 10 nurseries are recorded in table 24. Nurseries were also seeded at St. Paul, Minn., Kearneysville, W. Va., and Arlington, Va., but no data were obtained at St. Paul because of winter-killing nor at the other two stations because of unfavorable weather following seeding.

The varieties are listed in the table in order of average infection at 10 stations. No variety was entirely free from bunt at all stations and the infections ranged from 0.02 percent to 49.7 percent. Minturki, a resistant commercial variety, had an average of 3.8 percent, and 28 varieties and selections proved to be more resistant than this variety. Oro had an average infection of 5.7 and Ridit 13.1 percent. Only six varieties had average infections higher than Ridit and three of these, i. e., Kharkof, Cheyenne, and Quivira, were grown as susceptible checks. Relief developed smut at only two stations and Hohenheimer had smut at only one station. In the case of Hohenheimer and Albit, winter-killing was rather severe and the varieties were so late that good bunt readings could not be obtained. Meister's wheat x rye hybrid continued to produce very little smut as did Hope x Hussar (C. I. 11834) and Cheyenne selection (C. I. 11666). In last year's report it was pointed out that Hussar was developing more bunt than in previous years. Again in 1938 the average for Hussar was 9.9 percent, a figure nearly as high as the 11.5 percent reported the previous year. It was thought that the explanation for the high reading a year ago was a possible contamination with a race of Tilletia prevalent on the West Coast and to which Hussar is completely susceptible. An attempt was made to obtain clean seed for the 1938 nursery but apparently there is some contamination in the inoculum from the various stations. It is very encouraging that so many varieties and strains are available that carry so much resistance to the races of bunt to which they are being tested.

For the 7-year period (1932-38) only 10 varieties may be compared. Turkey selection (C. I. 10016) and Nebred have the lowest average infections of this group. For the shorter periods, Relief, Meister's wheat x rye hybrid, and Martin x Tenmarq 3 (C. I. 11805) have the lowest infections. A number of Oro x Tenmarq lines continue to develop less bunt than the Oro parent.

There continues to be evidence of the presence of different physiologic races in the inoculum used at different stations. This is most evident in comparing results of tests at Stillwater, Okla., and Bozeman, Mont. At both stations the check varieties Kharkof, Cheyenne, and Quivira have approximately the same susceptible reaction, yet there are striking differences in the reactions of Albit, the Oro x Tenmarq selections, and Hope x Hussar (C. I. 11835). Many selections and varieties found to be resistant in the uniform bunt nurseries have also been tested separately for their reaction to all of the known races of Tilletia. The results of tests made up to and including 1936 were presented in a previous report. In table 25 data are recorded on the reaction of Oro x Tenmarq (C. I. 11673) to all of the known races. It will be noted that this hybrid is resistant to all races except L-1, to which it is intermediate and to L-8 to which it is completely susceptible. So far race L-8 has not been collected in the hard red winter wheat area except in Montana. Results of tests with other winter as well as spring wheat varieties and selections are included in this table for the information of those interested in the material for further breeding purposes.

January, 1939.

Table 24. - Summary of bunt infection on 50 varieties and strains of wheat grown in the Great Plains uniform winter-wheat bunt nursery at 10 stations in 1937-38, and average bunt infections for 1932 to 1938

Variety	C. I. No.	Average percentage of bunt at: Denton, Tex.	Amarillo, Tex.	Stillwater, Okla.	Woodward, Okla.	Manhattan, Kans.	Akron, Colo.	Fort Collins, Colo.	Lincoln, Nebr.	North Platte, Nebr.	Bozeman, Mont.	Average 10 stations 1938	Weighted average 1937 and 1938	1936 to 1938	1932 to 1938
Relief	10082	0	0	0	0	0	0	0.2	0	0	T	0.02	0.6	0.9	---
Hohenheimer	11458	0	0	0	0	1/	0.5	0	0	0	0	0.1	---	---	---
Wheat x rye (Meister)	11403	0	0	0	0	0	0.6	1.8	0	0	1.0	0.3	0.2	0.9	---
Hope x Hussar	11834	0.3	0	0	0	2.5	0.2	0.2	0.9	0	1.0	0.5	---	---	---
Cheyenne selection	11666	0	0	0	0	0.2	0.4	3.0	0	0.2	3.0	0.7	3.0	2.2	---
Turkey selection	10016	0	0	0.5	0	2.0	2.0	1.5	0	0.5	2.5	0.9	1.5	1.9	1.4
Kanred x Ridit	11840	0	0.7	1.8	0	0	0.7	1.9	0	0.9	3.0	0.9	---	---	---
Martin x Tenmarq 3	11805	0	0	0	0	1.3	0	0.2	0	0.2	8.5	1.0	0.9	---	---
Nebred	10094	0	0.6	0	0	0.2	1.2	2.9	0	0.4	8.5	1.4	2.2	2.2	2.0
Kanred x Minturki	11839	0	2.0	0	0	0.5	1.5	2.3	0	0.9	7.0	1.4	---	---	---
Turkey selection	11841	0	0	0	0	0	4.4	4.9	0	0.2	6.5	1.6	---	---	---
Martin x Tenmarq 3	11823	0	0.4	1.5	0	2.7	1.0	2.2	0	0	9.0	1.7	---	---	---
Turkey selection	11846	0.3	0.3	0.5	0	0	1.9	2.8	0	0.3	11.5	1.8	---	---	---
Tenmarq x Minturki	11833	0	0.4	2.0	0	0	6.3	3.7	0.2	0.5	6.0	1.9	---	---	---
Nebr. 1069 x Tenmarq	11842	0	0	1.8	0.4	0.2	0.9	2.9	0	0.2	12.5	1.9	---	---	---
Oro x Tenmarq	11729	0	0	0.3	0	0	0.2	4.2	0	0	15.5	2.0	2.4	1.8	---
Martin x Tenmarq 3	11824	0	0	0	0	3.5	0	1.6	0	0.2	16.0	2.1	---	---	---
Fulhard x Oro	11732	0	0	0	0	0	0	7.4	0	0	15.0	2.2	2.8	2.3	---
Oro x Tenmarq	11807	0	0	0.3	0	0	1.5	1.4	0	0	20.0	2.3	1.8	---	---
Martin x Tenmarq 3	11804	0	1.5	0.3	0	2.3	0.2	5.5	0	0.2	13.5	2.4	2.0	---	---
Sherman x Kanred	11820	0	0	0	0	1.0	1.7	5.4	0	0	15.5	2.4	3.9	---	---
Martin x Tenmarq 3	11825	0.4	0	2.5	0.6	3.9	1.5	1.0	0	0.4	13.5	2.4	---	---	---
Albit	8275	0	0	0	0	0	0.2	5.9	0	0	20.0	2.6	---	---	---
Minturki x Blackhull	11671	0	1.7	3.8	0.8	0.3	3.0	5.9	0	1.6	8.5	2.6	3.1	2.6	---
Yogo	8033	0	0.3	1.0	0	0.3	5.2	7.8	0	1.7	11.5	2.8	3.8	3.3	2.4
Kanred x Oro	11803	0	0.2	0.3	0	6.6	0	3.5	0	0	18.5	2.9	---	---	---
Oro x Tenmarq	11674	0	0	1.0	0	2.9	1.7	3.6	0	1.0	20.0	3.0	4.6	3.4	---
Quivira x Fulhard - Oro	11811	0.5	0	1.8	0	0	1.5	4.0	0.3	0	29.0	3.7	5.4	---	---
Minturki	6155	1.3	5.3	3.4	0.5	1.7	9.5	5.8	1.9	4.0	4.5	3.8	5.8	4.6	5.9
Oro x Tenmarq	11832	0	1.3	1.8	0.5	0.4	1.5	5.7	0	1.8	25.0	3.8	---	---	---
Do	11828	0	2.2	0.3	0	0	0.2	5.4	0	1.2	32.5	4.2	---	---	---
Do	11731	0	0.8	0	0	0	1.7	4.7	0.5	0.3	35.0	4.3	4.6	3.7	---
Do	11726	0	0	0	0	0	0.7	7.0	0	0	37.5	4.5	5.6	4.5	---
Hope x Hussar	11836	1.3	2.0	12.0	0.7	0	8.0	6.4	2.8	3.2	9.0	4.5	---	---	---
Quivira x Fulhard - Oro	11831	0.8	0.9	2.0	0.4	0.2	3.0	7.7	0.9	0.4	30.0	4.6	---	---	---
Beloglina x Hussar	11838	0	0.9	8.5	0.7	0	10.0	6.9	4.3	3.0	12.0	4.6	---	---	---
Oro x Tenmarq	11829	0	0	1.0	0.5	1.5	3.7	5.4	0.5	0	40.0	5.3	---	---	---
Oro	8220	0.8	0	2.0	0.2	1.6	6.2	9.2	3.6	3.3	30.0	5.7	7.3	6.1	5.2
Oro x Tenmarq	11673	0	0	0.8	0.2	0.4	3.5	9.3	0.8	0.3	43.5	5.9	6.1	4.7	---
Do	11830	0	0	2.0	0	0.3	0.9	5.4	0	0	50.0	5.9	---	---	---
Do	11672	0	1.7	2.0	0	0.5	2.2	9.3	0.2	1.4	50.0	6.7	7.7	6.1	---
Do	11827	1.0	0	1.0	2.0	0.7	3.2	12.9	1.0	1.0	50.0	7.3	---	---	---
Hussar	4843	6.0	19.2	10.8	4.7	13.0	9.0	6.9	7.5	12.5	9.0	9.9	10.7	7.8	3.9
Ridit	6703	2.1	11.1	32.0	2.4	4.7	17.0	15.9	4.7	17.6	23.5	13.1	8.1	6.0	5.1
Hope x Hussar	11835	5.5	4.8	44.3	10.4	5.6	26.0	27.7	7.4	9.7	11.5	15.3	---	---	---
Hope x Kawvale	11826	14.2	17.1	57.6	12.9	6.9	33.9	24.5	22.0	18.6	27.5	23.5	---	---	---
Do	11837	9.8	39.3	59.1	18.5	4.8	30.0	32.0	15.6	20.1	52.5	28.2	---	---	---
Kharkof	1442	9.3	18.8	73.1	10.2	20.9	59.9	58.7	19.4	51.5	47.5	36.9	41.3	39.8	43.8
Cheyenne	8885	9.6	23.2	55.8	12.2	20.9	58.0	62.2	30.6	50.3	52.5	37.5	47.0	43.3	42.7
Quivira	8886	43.0	68.7	73.4	30.0	18.3	56.2	56.2	29.1	47.0	75.0	49.7	54.5	50.1	44.4
Average		2.1	4.5	9.2	2.2	2.7	7.7	9.5	3.1	5.1	20.9				

1/ All winter-killed.

Table 25.- Reaction of varieties and selections of spring and winter wheats to the known physiologic races of Tilletia in 1937 and 1938 1/

Variety or Cross	C. I. No.	Year	Race number and percentage smut																	
			T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10	T-11	L-1	L-2	L-3	L-4	L-5	L-6	L-7	L-8
Spring:																					
Thatcher	10003	1937	30.0	3.0	44.0	39.0	26.0	16.0	29.0	35.0	6.0	17.0	34.0	33.0	60.0	43.0	43.0	45.0	50.0	16.0	29.0
Hope	8178	"	1.0	.2	3.0	1.0	1.0	1.0	2.0	1.0	1.0	0	1.0	1.0	3.0	2.0	0	1.0	1.0	.4	1.0
Renown	11709	"	4.0	.2	.2	.2	.2	.0	2.0	2.0	1.0	.2	2.0	5.0	4.0	1.0	1.0	.4	2.0	.4	5.0
Komar x Hussar	11715	"	0	.4	0	1.0	0	0	2.0	9.0	0	0	1.0	0	0	.4	.4	.2	1.0	7.0	.2
Hard Federation x Hussar	11792	"	0	0	0	.2	3.0	1.0	4.0	23.0	1.0	0	1.0	2.0	0	0	.4	3.0	12.0	52.0	0
Mercury	11872	"	13.0	1.0	0	1.0	.3	1.0	2.0	9.0	9.0	.2	3.0	8.0	8.0	4.0	1.0	1.0	5.0	.4	3.0
Pilot	11428	"	23.0	2.0	0	10.0	.3	2.0	6.0	22.0	1.0	1.0	12.0	32.0	26.0	9.0	2.0	7.0	12.0	1.0	20.0
Apex	11636	"	7.0	1.0	30.0	7.0	32.0	9.0	13.0	31.0	.4	8.0	16.0	20.0	41.0	47.0	44.0	21.0	25.0	34.0	25.0
B44 x Reward	11868	1938	16.0	32.0	43.0	25.0	31.0	38.0	59.0	34.0	60.0	51.0	31.0	28.0	34.0	51.0	33.0	43.0	--	50.0	41.0
Merit	11870	"	4.0	1.0	0	1.0	.2	.4	1.0	2.0	2.0	.2	.3	3.0	11.0	2.0	1.0	.4	--	1.0	3.0
Reliance x Hope	11788	"	.4	.4	0	0	0	0	.2	0	0	0	0	1.0	1.0	.4	0	0	--	0	1.0
Vesta	11712	"	8.0	7.0	2.0	9.0	5.0	11.0	11.0	1.0	.3	0	.2	10.0	23.0	26.0	15.0	10.0	--	14.0	13.0
Winter:																					
Oro x Tenmarq	11673	"	1.0	3.0	7.0	0	2.0	1.0	2.0	2.0	2.0	2.0	1.0	14.0	1.0	2.0	2.0	1.0	--	5.0	86.0
Oro x Turkey - Florence	11865	"	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--	1.0	1.0
Hussar x Hohenheimer	10065-1	"	0	0	0	0	0	0	0	0	1.0	2.0	0	0	0	0	0	0	--	0	0
Relief x Ridit	11905	"	0	0	0	0	0	0	0	0	0	0	1.0	0	0	0	0	0	--	0	0
Relief	10082	"	0	0	0	1.0	5.0	1.0	1.0	13.0	0	0	0	0	0	0	0	4.0	--	9.0	0
Rio	10061	"	0	0	0	0	0	0	0	0	0	0	0	5.0	0	0	1.0	0	--	0	80.0
Rex selection	11689	"	1.0	1.0	0	28.0	22.0	51.0	71.0	69.0	0	0	0	0	1.0	0	66.0	42.0	--	50.0	0
Turkey	11530	"	0	0	0	4.0	12.0	6.0	9.0	26.0	0	0	0	0	0	0	17.0	11.0	--	60.0	0
Kymar	11605	"	0	0	0	54.0	64.0	56.0	90.0	68.0	0	0	0	0	0	0	70.0	84.0	--	61.0	0
Hussar x Fulcaster	--	1937	.3	.3	2.0	7.0	17.0	28.0	26.0	54.0	1.0	0	16.0	0	1.0	0	14.0	29.0	41.0	35.0	0
Hussar x Leap	--	"	0	0	2.0	3.0	26.0	7.0	30.0	81.0	6.0	0	18.0	1.0	0	0	15.0	24.0	63.0	65.0	0
Hussar x Portage	--	"	0	0	0	2.0	7.0	13.0	30.0	62.0	4.0	1.0	6.0	0	.3	0	25.0	22.0	47.0	71.0	0
Hussar x Nabob	--	"	.3	1.0	0	5.0	4.0	27.0	39.0	71.0	1.0	.3	13.0	.3	0	2.0	39.0	44.0	59.0	73.0	0
Hussar x V.P.I.112	--	"	0	0	0	3.0	12.0	11.0	32.0	80.0	8.0	1.0	16.0	0	0	1.0	22.0	28.0	56.0	72.0	.3
Hussar x Forward	--	"	1.0	1.0	0	2.0	15.0	15.0	36.0	76.0	7.0	1.0	14.0	2.0	3.0	1.0	34.0	36.0	76.0	60.0	4.0
Berkeley Rock selection 47-55	--	"	2.0	0	2.0	16.0	14.0	60.0	70.0	87.0	3.0	1.0	15.0	2.0	3.0	1.0	90.0	80.0	79.0	89.0	0

1/ These tests were made by C. S. Holton and H. A. Rodenhiser in cooperation with E. H. Bamberg and J. W. Taylor. The spring wheat tests were made at Bozeman, Mont., and the soft red winter wheat tests at Arlington, Va. The remaining western winter wheats were tested at Pullman, Wash. Data on other varieties and selections were distributed in 1936.

UNIFORM WINTER WHEAT RUST NURSERIES

In tables 26 and 27 are presented the data on severity of leaf and stem rust infection on the 30 varieties of winter wheat grown in observation nurseries throughout the country in 1938. These preliminary data are included in this report through the kindness of Dr. H. B. Humphrey. At some future date a complete report of these nurseries will be issued and the rust percentages may not agree entirely with those presented here since the data shown included only figures for the severity of infection.

Differential data for leaf-rust infection were obtained for all varieties at 17 stations. The averages for these stations again demonstrated the lack of resistance among hard wheats. The most resistant hard wheats were Hope x Hussar sel. (C. I. 11682), Hard Federation x Kawvale (C.I.11753) and Oro x Tenmarq (C. I. Nos. 11672 and 11673).

Stem-rust readings were made on all varieties at 11 stations (table 27). Among the hard wheats Hope x Hussar sel. (C. I. 11682) is the most resistant. Minturki x Blackhull (C. I. 11815), Kawvale x Tenmarq (C. I. Nos. 11750 and 11669), and Blackhull sel. (C. I. 11737) had lower averages than most strains. Hussar was the most susceptible hard wheat.

Table 26. - Severity of leaf-rust infection on winter-wheat varieties grown in the Uniform Rust Observation Nursery, 1938

Variety	C.I. No.	Percent severity of leaf rust infection at: Tifton, Ga.	Statesville, N.Car.	Blacksburg, Va.	Jackson Ferry, Va.	Elk Creek Va.	Chilhowie Va.	Arlington Farm, Va.	Lexington Ky.	Wooster, Ohio	Bedford, Ind.	LaFayette Ind.	Urbana, Ill.	Columbia, Mo.	Kanawha, Iowa	Ames, Iowa	College Station, Tex.	Denton, Tex.	Stillwater, Okla.	Manhattan, Kans.	Lincoln, Nebr.	Granger, Ore.	Av. for 17 stations 2/
Soft White Winter																							
Democrat	3384	90	40	95	75	--	95	20	80	95	100	85	1.0	65	1/	1/	10	65	80	45	15	1	62.1
Soft Red Winter (Early)																							
Kanred x Gipsy sel.	11382	55	10	20	25	65	80	15	60	90	3	20	0.2	30	10	40	10	T	40	10	5	3	28.0
Fultz x Kanred sel.	11748	60	5	80	5	60	60	20	50	75	Tr	20	0.3	40	10	50	10	T	65	25	5	0	30.6
Mediterranean x Hope sel.	11763	30	2	60	30	10	20	10	25	15	0+	5	0.2	30	10	20	T	2	5	T	T	5	14.1
Soft Red Winter (Late)																							
Denton	8265	65	10	50	50	50	60	5	60	50	10	20	0.2	25	20	20	15	10	60	25	10	3	31.1
Mediterranean	3332	75	60	95	75	85	80	25	90	95	100	75	0.9	50	1/	40	5	65	80	60	50	0	63.5
Purdue No. 1	11380	85	50	80	80	70	90	25	85	90	75	75	0.9	90	85	60	20	85	90	70	75	14	69.4
Fultz sel.	11384	20	tr.	10	50	25	60	10	30	90	tr.	30	0.2	25	5	25	T	T	5	5	T	tr.	19.7
Minhardi	5149	90	50	90	65	90	70	20	90	80	95	90	0.9	60	65	75	40	100	100	100	95	20	73.8
Fultz sel.	11845	75	tr	15	50	30	65	10	40	85	10	30	+-	20	5	40	5	1	5	5	T	tr.	24.5
Hope x Kawvale	11822	10	10	60	40	55	35	30	50	15	0	0	0.3	20	1/	15	5	25	5	T	5	9	18.8
Red Rock x Hope	11821	70	1	10	25	5	20	1	2	70	tr.+	0	0.1	15	1/	10	10	T	T	T	5	0	13.5
Hard Red Winter (Early)																							
Kanred x Red Rock sel.	11381	50	15	30	65	40	55	30	70	80	tr	25	0.5	30	10	10	25	20	65	25	5	5	35.0
Hard Fed. x Kawvale	11753	35	tr.	5	50	50	60	2	40	75	5	25	0.4	30	50	50	10	T	65	10	0	0	24.2
Kawvale x Tenmarq sel.	11369	25	10	25	50	60	60	30	65	60	5	25	0.6	40	30	50	5	25	65	20	15	1	30.9
" " "	11750	15	1	60	65	25	65	50	90	85	10	80	0.2	25	10	35	5	15	65	30	5	2	39.3
Fulcaster x Tenmarq sel.	11751	20	2	50	65	25	65	35	50	65	5	25	0.3	20	10	1/	5	2	65	5	T	2	28.3
Turkey sel.	10016	50	20	75	60	55	75	60	90	40	50	75	0.8	40	80	85	40	100	100	100	95	15	63.8
Kanred-Fulcaster x Tenmarq sel.	11752	50	5	80	50	35	60	50	60	50	25	30	0.7	15	40	40	5	20	25	45	20	4	34.9
Hard Red Winter (Late)																							
Blackhull sel	11737	95	40	85	70	35	60	65	70	90	75	85	1.0	80	100	75	15	70	100	100	70	10	69.4
Oro x Tenmarq	11672	20	10	25	65	20	40	40	65	20	15	15	0.3	10	10	1/	5	15	25	10	30	2	24.2
Oro x Tenmarq	11673	5	5	35	50	35	60	35	40	65	10	15	0.3	10	10	40	5	20	25	10	20	2	24.2
Hope x Hussar sel.	11682	25	tr	3	20	T	10	tr	10	5	tr	0	0.0	10	1/	1/	T	T	T	T	0	0	4.9
Hussar	4843	80	15	20	75	40	55	15	90	40	35	50	0.4	45	1/	1/	50	90	70	50	75	tr+	50.3
Malakof	4898	85	5	35	60	60	60	10	80	85	90	25	1.0	65	90	60	40	100	100	100	95	tr	60.8
Turkey sel.	10094	40	50	80	70	80	60	65	60	50	100	50	1.0	50	90	75	40	100	100	100	95	8	65.8
Kharkof	1442	55	10	85	75	80	65	65	80	95	80	35	0.8	60	90	80	20	90	100	100	50	12	63.4
Minturki	6155	80	45	80	65	90	70	50	90	90	75	85	1.0	65	100	90	40	90	100	100	80	5	71.2
Minturki x Blackhull	11815	85	10	95	80	90	65	70	80	90	95	85	0.8	50	65	85	20	100	100	90	80	4	70.5
Turkey Sel.	11734	90	70	85	80	90	40	70	85	90	95	90	0.8	60	90	85	50	100	100	100	95	28	78.1

1/ Winter-killed.

2/ Excluding Elk Creek, Va., Urbana, Ill., Kanawha, Iowa, and Ames, Iowa.

Table 27. - Severity of stem-rust infection on winter-wheat varieties grown in the Uniform Rust Observation Nursery, 1938

Variety	C.I. No.	Percent severity of stem-rust infection at: Tifton, Ga.	Lexington, Ky.	Jackson's Ferry, Va.	Elk Creek Va.	Chilhowie Va.	Bedford, Ind.	Lafayette, Ind.	Columbia, Mo.	Kanawha, Iowa	Ames, Iowa	College Station, Tex.	Denton, Tex.	Stillwater, Okla.	Manhattan, Kans.	Lincoln, Nebr.	Av. for 11 stations 2/
Soft White Winter																	
Democrat	3384	40	75	40	--	50	Tr	tr	40	1/	1/	70	40	65	40	65	47.7
Soft Red Winter (Early)																	
Kanred x Gipsy sel.	11382	50	70	30	25	50	Tr	tr	35	50	20	80	20	65	50	65	46.8
Fultz x Kanred sel.	11748	50	40	45	20	40	Tr	tr	35	40	30	50	10	80	45	80	43.2
Mediterranean x Hope sel.	11763	tr	tr	5	1	10	0	tr	5	0	5	20	T	T	33	28	9.2
Soft Red Winter (Late)																	
Denton	8265	60	15	45	35	40	Tr	1	40	40	40	85	40	80	65	80	50.1
Mediterranean	3332	60	25	60	40	55	Tr	5	50	1/	40	80	50	60	40	80	51.4
Purdue No. 1	11380	75	36	75	40	65	Tr	2	50	40	20	100	15	45	25	65	50.2
Fultz sel.	11384	50	5	55	50	60	1	tr	50	40	20	90	45	80	45	80	50.9
Minhardi	5149	60	10	60	55	50	1	1	40	65	50	100	65	85	50	70	53.7
Fultz sel.	11845	70	2	80	60	60	2	2	65	70	50	100	10	85	60	85	56.3
Hope x Kawvale	11822	1	0	15	2	1	0	tr	5	1/	0	10	T	31	21	33	10.6
Red Rock x Hope	11821	50	tr	15	2	5	0	0	40	1/	10	25	10	T	40	45	20.9
Hard Red Winter (Early)																	
Kanred x Red Rock sel.	11381	60	10	45	15	30	Tr	tr	30	50	1/	60	10	40	45	80	37.3
Hard Federation x Kawvale	11753	10	tr	30	20	25	Tr	tr	30	30	20	40	15	40	60	65	28.6
Kawvale x Tenmarq sel.	11669	10	10	15	10	5	0	0	40	30	15	70	5	10	20	60	22.3
" " "	11750	5	3	30	15	10	Tr	0	40	10	20	60	10	5	20	60	22.1
Fulcaster xTenmarq sel.	11751	25	0	25	10	30	Tr	tr	40	10	1/	70	10	45	20	80	31.4
Turkey sel.	10016	tr	1	40	1	20	Tr	tr	40	30	30	60	20	10	25	65	25.5
Kanred-FulcasterxTenmarq sel.	11752	5	tr	50	10	10	Tr	tr	40	30	30	100	10	45	20	65	31.4
Hard Red Winter (Late)																	
Blackhull sel.	11737	10	tr.	+60	3	20	Tr	0	30	10	30	50	10	15	10	45	22.7
Oro x Tenmarq	11672	30	5	30	15	15	Tr	Tr	40	50	1/	75	5	10	10	40	23.6
Oro x Tenmarq	11673	50	2	15	20	25	0	Tr	30	40	10	75	10	25	15	45	26.5
Hope x Hussar sel.	11682	10	tr	5	0	0	0	0	10	1/	1/	5	5	0	0	T	3.2
Hussar	4843	60	5	65	40	20	Tr	tr	50	1/	1/	100	60	65	45	65	48.6
Malakof	4898	20	1	50	10	20	Tr	tr	30	10	20	50	30	10	40	25	25.1
Turkey sel.	10094	5	tr	30	5	65	Tr	tr	30	20	10	40	40	60	25	45	30.9
Kharkof	1442	40	1	65	15	50	Tr	tr	40	30	40	50	30	60	40	45	38.3
Minturki	6155	30	tr	50	T+	30	Tr	Tr	40	20	30	25	30	40	10	60	28.6
Minturki x Blackhull	11815	25	0	35	5	15	Tr	0	40	20	30	15	15	10	2	45	18.4
Turkey sel.	11734	35	tr	65	1	55	Tr	Tr	30	20	30	30	40	45	30	50	34.5

1/ Winter-killed. 2/ Excluding Elk Creek, Va., Bedford, Ind., Kanawha, Iowa, and Ames, Iowa.

DISEASE GARDEN

In table 28 is presented a summary of the data obtained in the disease garden at Manhattan, Kans. The bunt percentages were supplied by D. B. Creager and the other data by C. O. Johnston. The splendid cooperation of these men is greatly appreciated.

It will be seen that only a few of the 50 varieties and strains included in this nursery showed any great amount of resistance to either leaf or stem rust. Some Oro x Tenmarq lines were moderately resistant. A number of Hope x Hussar and Hope x Cheyenne strains showed resistance to one or both rusts. At the present time these wheats seem to offer promise as a source of rust-resistant winter wheats. In the case of bunt infection resistant lines are available showing that more progress has been made in breeding for bunt resistance than has been the case for rust resistance.

Data are also presented showing the percentage of broken straws for each of the varieties. It will be noticed that there is a tendency for the straw to be more brittle where the rust readings were the highest. Also the broken straws seemed to be particularly bad in all strains having Blackhull as a parent. Among the more rust-resistant strains straw breaking was not so severe although no strain stood up 100 percent.

Table 28. - Reaction of varieties of winter wheat in the disease garden at Manhattan, Kans., to leaf rust, stem rust, bunt, and mildew, 1938

Variety	C. I. No.	Percent of infection			Mildew	Broken straw (pct.)
		Leaf rust	Stem rust	Bunt		
Kharkof	1442	100	85	44.4		25
Kanred x Hope-Hard Federation	11843	100	25	10.9		25
Tenmarq x Nebraska No. 28	11847	80	65	0		40
Blackhull	6251	100	40	10.9		85
Turkey sel.	11734	100	80	2.5		90
Cheyenne sel.	11666	100	85	0		80
Kanred x Blackhull	11844	100	85	14.8		90
Turkey x Marquis	11747	90	65	12.6		60
Turkey sel.	10094	100	80	0		80
Turkey sel.	11576	85	85	10.3		75
Turkey sel.	11577	100	80	0		85
Minturki x Blackhull	11815	100	20	2.0		98
Kawvale x Tenmarq	11669	70	40	1.2	Moderate	25
Minturki x Blackhull	11671	100	20	2.2		98
Kawvale x Tenmarq	11750	85	25	44.7	Moderate	25
Kanred x Marquis	11589	65	40	34.3		20
Blackhull sel.	11737	100	20	57.6		100
Kanred x Marquis	11746	70	65	14.6		60
Tenmarq x Minturki	11580	60	40	1.5		50
Oro x Fulhard	11579	100	65	0.4	Moderate	75
Oro x Tenmarq	11672	20	25	0.4		25
Oro x Tenmarq	11673	20	40	1.0		25
Cheyenne	8885	100	85	35.4		75
Minturki	6155	100	45	6.3		85
Martin x Tenmarq[3]	11823	60	80	5.9		25
Minturki x Marquis	11658	100	60	0.7		40
Martin x Tenmarq[3]	11804	60	45	0		25
Minturki x Marquis	11501	100	65	2.0		20
Martin x Tenmarq[3]	11805	45	65	0.4		25
Hope x Cheyenne (Nebr.sel. 363342)		T	T	13.3	Slight	20
Wheat x Rye (Meister)	11403	90	20	2.3		20
Oro x Tenmarq	11731	25	65	1.4		25
Hope x Kawvale	11822	T-80	T	5.4	Moderate	15
Hope x Kawvale	11826	T	T	11.8		15
Fulhard x Oro	11732	90	80	0	Severe	20
Hope x Cheyenne (Nebr.sel. 363344)		T	T	0	Slight	15
Hope x Hussar	11834	T	T	0	Slight	20
Hope x Hussar	11835	80	2	0	Slight	20
Hope x Hussar	11836	T	T	0	Slight	20
Hope x Hussar	11837	5	5	0	Slight	20
Beloglina x Hussar	11838	90	65	0.8		25
Kanred x Minturki	11839	100	40	0		25
Kanred x Ridit	11840	65	40	0		25
Turkey sel.	11841	100	80	0.4		25
Turkey sel.	11848	100	80	0		25
Sherman x Kanred	11820	90	40	0		25
Hope x Cheyenne (Nebr. sel. 363324)		T-90	T	13.6		50
Hope x Cheyenne (Nebr. sel. 363334)		T	T	10.0		50
Hope x Cheyenne (Nebr. sel. 363339)		T-80	T	8.3		50
Chiefkan	11754	70	65	59.0		20