UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF PLANT INDUSTRY

[NOT FOR PUBLICATION WITHOUT PERMISSION]

COMPARISON OF WINTER WHEAT VARIETIES GROWN IN COOPERATIVE PLOT AND NURSERY EXPERIMENTS IN THE HARD RED WINTER WHEAT REGION IN 1940

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COMPARISON OF WINTER WHEAT VARIETIES GROWN IN COOPERATIVE PLOT AND NURSERY EXPERIMENTS IN THE HARD RED WINTER WHEAT REGION IN 1940

by

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EXPERIMENTS IN 1940

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

Ames, Iowa, was added to the list of cooperating stations, since a uniform yield nursery was grown there in 1940. For many years this station has cooperated by growing a uniform winter-hardiness nursery.

The Regional Hard Red Winter Wheat Quality Laboratory at Manhattan, continued to evaluate a number of individual samples from the various stations. In addition to milling and baking studies a large number of doughball, carotene, and pearling determinations were made. These data are reported to the various cooperators or are issued in a separate summary.

This report is a summary of the 1940 data from all cooperating stations as well as a summary of yield data for the 10-year period ending in 1940. The cooperating agencies, stations, and personnel concerned in these experiments are as follows:

1/ The writer wishes to express his appreciation to Konyon T. Payne, Theodore H. Johnston, and Dale E. Weibel, Agents, of Lincoln, Nebr., for their assistance in assembling the data and making the computations in this summary.

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 Experiment Station	E. S. McFadden
Denton	Substation No. 6	I. M. Atkins
Chillicothe	Substation No. 12	J. R. Quinby, I. M. Atkins
Bushland		David A. Reid
OKLAHOMA AGRICULTURAL EXPERIMENT STATION:		
Field Crops and Soils		H. F. Murphy
*Lawton	U.S. Dry Land Field Station 2/	W. M. Osborn
Stillwater	A. & M. College	C. B. Cross
*Woodward	Southern Great Plains Field Sta. 2/	V. C. Hubbard
Goodwell	Panhandle Agr. Expt. Station	Clyde H. Jamison
KANSAS AGRICULTURAL EXPERIMENT STATION:		
Agronomy		R. I. Throckmorton
Manhattan	Kansas State College	H. H. Laude, L. P. Reitz, E. G. Heyne
Hays	Ft. Hays Branch Expt. Station	A. F. Swanson
Colby	Colby Branch Station	E. H. Coles
COLORADO AGRICULTURAL EXPERIMENT STATION:		
Agronomy		Alvin Kezer
*Akron	U. S. Dry Land Field Station 2/	J. J. Curtis
Fort Collins	State Agricultural College	D. W. Robertson
Hesperus	Fort Lewis Substation	D. W. Koonce
IOWA AGRICULTURAL EXPERIMENT STATION:		
Ames	Iowa State College	L. C. Burnett, H. C. Murphy
NEBRASKA AGRICULTURAL EXPERIMENT STATION:		
Agronomy (Experimental)		T. A. Kiesselbach
Lincoln	Agricultural Expt. Station	K. S. Quisenberry
North Platte	North Platte Substation	O. J. Webster, L. L. Zook
Alliance	Box Butte Experiment Farm	Robert Pahl
Valentine	Valentine Substation	E. M. Brouse
WYOMING AGRICULTURAL EXPERIMENT STATION:		
*Sheridan	U. S. Dry Land Field Station 2/	R. S. Towle
MINNESOTA AGRICULTURAL EXPERIMENT STATION:		
Agronomy and Plant Genetics		H. K. Hayes
St. Paul	University Farm	E. R. Ausemus
Waseca	Southeast Experiment Station	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 Experiment Station	R. H. Bamberg
Moccasin	Judith Basin Branch Station	R. H. Bamberg, Orlie Smith
Havre	Northern Montana Branch Station	J. J. Sturm

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

ACCESSION NUMBERS ASSIGNED

As stated in the 1939 report, a list of all accession numbers assigned to wheats from the area will be presented each year in an attempt to keep the records straight.

Since the last report Minturki x Marquis (Minn. 2614, C.I. 11502) has been named Marmin and is so designated in this summary.

Accession Numbers Assigned in 1940

C.I.No.	Name	State No.
11992	Kawvale x Tenmarq	Nebr. No. 1114
11993	Minturki Backcross	Minn. N.S.N. II-29-76
11994	Minturki Backcross	Minn. N.S.N. II-29-62
11995	H-44 x Minhardi	Minn. N.S.N. I-37-7
11996	Minessa x Beloglina-Buffum	Moccasin Bulk Hybrid 23-2
11997	Iobred selection	Iowa Sel. No. 2473
11998	Iobred selection	Iowa Sel. No. 2488
11999	Cheyenne x Early Blackhull	Woodward No. 1126
12000	Cheyenne x Early Blackhull	Woodward No. 1127
12101	Blackhull x Cheyenne	Hays Cereal No. 40-102
12102	Blackhull x Tenmarq	Hays Cereal No. 40-115
12103	Cheyenne x Tenmarq	Kansas No. 2749
12104	Cheyenne x Tenmarq	Kansas No. 2750
12105	Kanred x Hard Federation 142 x Tenmarq	Denton No. 33-34-303
12106	Kanred x Hard Federation 25007 x Tenmarq	Denton No. 25-34-44

In the past C.I. numbers have been assigned to varieties being entered in the Great Plains form Bunt Nursery. This practice was discontinued in the fall of 1940 because so many of these eats are grown for one year only.

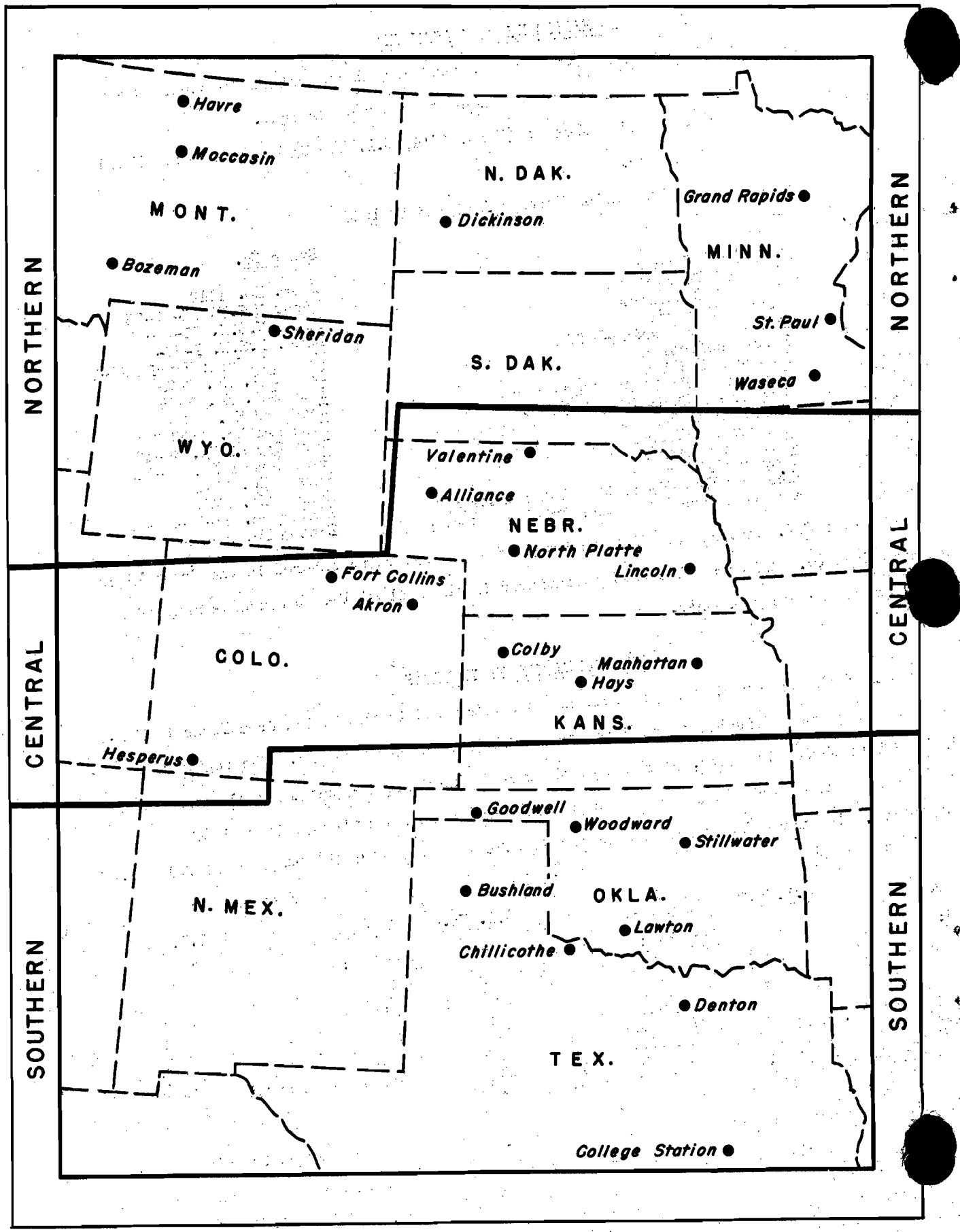
UNIFORM VARIETIES IN PLOTS

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 1940 were as follows:

Southern		Central		Northern	
Variety	C.I.No. 3/	Variety	C.I. No. 3/	Variety	C.I.No. 3/
Hard Red:		Hard Red:		Hard Red:	
Kharkof	1442	Kharkof	1442	Kharkof	1442
Tenmarq	6936	Tenmarq	6936	Minturki	6155
Blackhull	6251	Blackhull	6251	Yogo	8033
Early Blackhull	8856	Cheyenne	8885	Karmont	6700
Chiefkan	11754	Chiefkan	11754	Marmin	11502
Oro x Tenmarq	11673	Oro x Tenmarq	11673	Minard x Minhardi	8888
Kawvale x Tenmarq	11669	Kawvale x Tenmarq	11669	Nebred	10094
Kawvale	8180	Nebred	10094		

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

3/ C.I. refers to accession number of the Division of Cereal Crops and Diseases.


Havre
Moccasin
MONT.
Bozeman
Sheridan
WYO.
N. DAK.
Dickinson
S. DAK.
Grand Rapids
MINN.
St. Paul
Waseca
NORTHERN
NORTHERN
Valentine
Alliance
NEBR.
North Platte
Lincoln
Fort Collins
Akron
COLO.
Colby
Manhattan
Hays
KANS.
CENTRAL
CENTRAL
Hesperus
Goodwell
Woodward
Stillwater
Bushland
OKLA.
N. MEX.
Lawton
Chillicothe
Denton
TEX.
SOUTHERN
SOUTHERN
College Station

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.

PLOT DATA

In general, seed beds were very dry in the fall of 1939. At one station (Colby) it was found impossible to plant, at other places seeding was delayed until moisture was received, while at some other stations seed was put into dry ground and the plants did not emerge until the winter or early spring. Plots were seeded at 22 cooperating stations. Volunteer spring grain which survived the winter caused trouble at several stations. Complete failures were reported from Akron, Alliance, and Valentine due to drought. At Bozeman, field mice, working under the snow, ruined the stands and no report was received from Havre. Yield and other agronomic data for varieties grown at each of 17 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. In a number of cases the only data obtained were dates of maturity, height, test weight, and yield. For each station the varieties are listed in order of yield for 1940, and, where possible, average yields are given for various 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.

The season was most unusual and in some quarters the term "miracle" has been used to describe the 1940 winter wheat crop. As stated before, in the southern and central districts the fall was dry, seedbeds poor, germination late and spotted, fall growth slow or lacking. In vast areas of central Nebraska and western Kansas no growth was noted in the fall and the crop was all but given up. The season was open until about Christmas when moisture came in the form of snow or rain followed by colder weather. Although temperatures were very low during January, snow covered the ground and little killing was noted, in fact volunteer oats lived through the winter at Lincoln and Manhattan. Spring conditions were such that the crop made fair growth on the moisture available. Spring emerged wheat began to give promise of a small crop and crop estimates were steadily increased. Temperatures remained low and timely rains were received so that a crop could be matured. Stem rust developed rapidly in Texas and started to move north fairly early, but only in limited areas where the crop was very late did it become serious. Conditions were very spotted, straw tended to be short, but grain quality was fair to good and yields while low were better than expected. Several times the crop was on the point of failure due to drought but each time rains changed the outlook. Absence of hot winds and serious rust damage permitted late fields

to mature. So far as varietal comparisons are concerned, the data obtained are not especially valuable due to the absence of hazards and the extreme variability in yields caused by lack of moisture.

At Denton, stands were fairly good, straw was of average height, and harvest was several days later than in 1939. Both leaf and stem rust developed rather late in the season and no doubt had considerable influence on yield. Resistance to leaf rust was shown by Kawvale, Kawvale hybrids, two Mediterranean selections, and Denton. Early Blackhull had the lowest stem rust reading. Test weights ranged from 61.0 pounds per bushel for Chiefkan and Early Blackhull to 52.0 pounds per bushel for Denton and Fulcaster. Kawvale x Tenmarq (C.I. 11956) gave the highest yield, followed by Chiefkan and Kawvale x Tenmarq (C.I. 11953). Kharkof, Denton, Clarkan, and Fulcaster had the lowest yields. For the period 1931-40, Quivira, Tenmarq, and Kawvale continued to rank the highest for average yield. For the last three years Oro x Tenmarq (C.I. 11673), Chiefkan, and Kawvale x Tenmarq (C.I. 11669) have had the highest averages.

The crop at Chillicothe was somewhat below average as indicated by the short straw, and all yields were under 11 bushels per acre. Test weights per bushel ranged from 53 to 59 pounds per bushel. Kanred, Oro x Tenmarq (C.I. 11673), Quivira, Early Blackhull, and Blackhull had the highest yield and Kawvale the lowest. With the narrow range of yields, 2.5 bushels, it is doubtful if many of the differences are significant when considered in relation to the standard errors. For the 3-year period 1938-40, Blackhull, Tenmarq, and Kawvale x Tenmarq (C.I. 11669) have the highest rank.

Only the plots on dryland were harvested at Bushland, those under irrigation being so full of volunteer barley that yields were open to question. Yields on dryland were very low, ranging from 3.2 bushels for Turkey (Vaughn) to 4.9 bushels per acre for Chiefkan and Martin x Tenmarq^3 (C.I. 11805). All of the test weights were under 60 pounds per bushel. For the 6-year average yields, Kharkof and Blackhull ranked first with Quivira, Tenmarq, and Kanred about equal. For the last two years Early Blackhull, Blackhull, and Kawvale x Tenmarq (C.I. 11669) have had a slight advantage. It will be noted that only two varieties, Chiefkan and Martin x Tenmarq^3 (C.I. 11805), have outyielded Kharkof for the years grown, as expressed by percentage of Kharkof.

At Lawton a hail storm on May 20 caused some damage and may have had some influence on yields. Stem rust also developed rather late but the highest readings were 25 percent on such varieties as Cheyenne and Fulcaster. All varieties had test weights of 58 pounds per bushel or better. Three early varieties, Kawvale x Tenmarq (C.I. 11669), Chiefkan, and Tenmarq, had the highest yields, closely followed by Kanred. Early Blackhull ranked near the bottom of the list, although farmers near the station insist that this is their best variety. As a group the soft wheats yielded less than the ones classed as hard. For a 7-year average Kawvale, Tenmarq, and

red have had the highest average yields, while for a 2-year period, 1937 and 1940, Chiefkan s a slight advantage in yield over Tenmarq.

Only data from the uniform varieties were reported from Stillwater, but among these there was a rather wide range in yield. Blackhull ranked first with Kharkof second. At the bottom of the list were Kawvale and Early Blackhull. Chiefkan yielded about five bushels per acre less than Blackhull. Blackhull, Kharkof, and Tenmarq have the best average yields for the period 1931-40. For the last two years Kawvale x Tenmarq (C.I. 11669), Blackhull, and Oro x Tenmarq (C.I. 11673) rank the highest.

Straw was short at Woodward and test weights were all below 60 pounds per bushel. The highest yielding varieties were Kawvale x Tenmarq (C.I. 11669), Chiefkan, and Oro x Tenmarq (C.I. 11673). At this station the earlier strains seemed to yield higher than did the later ones, although there were some exceptions. Based on the long time average Quivira, Kharkof, Tenmarq, and Cheyenne have had the best yields, while for the last two years Kawvale x Tenmarq (C.I. 11669), Chiefkan, and Cheyenne rank at the top. At this station only five early varieties have outyielded Kharkof for the years grown, as indicated by the percentage of Kharkof.

At Goodwell, the crop was rather late and was helped by late rains. Test weights were low r all varieties except Early Blackhull, Kawvale being especially low. Early Blackhull, Chiefan, and Kawvale x Tenmarq (C.I. 11669) had the highest yields while Kawvale had the lowest. No variety has outyielded Kharkof for a 6-year average, although for the last two years Early Blackhull, Oro x Tenmarq (C.I. 11673), and Blackhull have made the best records.

At Manhattan, rather complete data were obtained and reported. There was a 9-day spread in heading dates between the earliest and latest variety, and a 4-day spread in ripening dates. Culm counts and straw strength data were reported and showed some interesting differences. Test weights were good and yields ranged from 23.5 to 32.2 bushels per acre. Four early hybrid strains and Chiefkan outyielded Tenmarq. Early Blackhull x Tenmarq (C.I. 11952), a very early variety, gave a good yield and apparently is stronger strawed than is Early Blackhull. Later varieties such as Nobred, Cheyenne, and Kharkof did not show up so well this year. Kawvale, Quivira, Clarkan, and Cheyenne are the highest yielders over a 9-year period. For the period 1937-38 and 1940, Kawvale x Tenmarq (C.I. 11669 and 11750), Oro x Tenmarq (C.I. 11673), and Quivira rank the highest. All varieties grown, except Harvest Queen, are equal or superior to Kharkof check, a number of early hybrid strains being especially high.

Emergence at Hays did not take place until spring and the crop matured later than usual, t in spite of this yields ranged from 11.9 to 17.8 bushels per acre. Straw was fairly short e to early drought while test weights ranged from 56 to 62 pounds per bushel. Again early strains gave the highest yields, about the only exception being Kawvale x Tenmarq (C.I.11750).

All of the later varieties of the Turkey type had the lower yields, as might be expected in view of the growing conditions. For a 9-year period Tenmarq, Early Blackhull, and Blackhull have had the highest average yields. For the average of the last two years Chiefkan ranks first, followed by Oro x Tenmarq (C.I. 11673), and Early Blackhull.

At Lincoln, growth was very uneven due to drought and there was considerable variability of yields in the different replications, as shown by the high standard errors. There was a spread of six days in heading dates, but all varieties ripened within a 4-day period. Average heights were all less than 30 inches and growth was so uneven within plots that binding was difficult. Three Kawvale x Tenmarq strains had the highest yields, followed by Turkey selection (C.I. 10016) and Blackhull. Cheyenne ranked ninth while Nebred was near the bottom of the list. Nebred again seemed to be injured more by drought than other varieties. For this period Cheyenne ranks first, Tenmarq second, and Kawvale third. For an average of the last two years Kawvale x Tenmarq (C.I. 11669), Chiefkan, and Oro x Tenmarq (C.I. 11673) have had the highest yields, although it is felt that these wheats are too winter tender for Nebraska.

The two replications on fallow were the only ones harvested at North Platte. There did not seem to be any close relation between time of maturity and yield. Turkey selection (C.I. 11577), Cheyenne selection (C.I. 11666), and Blackhull were the highest yielding varieties. Nebred ranked sixth, Cheyenne twelfth, and two Kawvale x Tenmarq selections gave the lowest yields. Over a 9-year period Cheyenne, Nebraska No. 60, Kharkof, and Local Turkey have had the highest average yields. During the two years 1939-40 Cheyenne selection has outyielded Cheyenne. The early varieties are not as outstanding at North Platte as at some other stations.

Very complete data were reported from Waseca where an unusually good crop was harvested. Considerable lodging was recorded and stem and leaf rust were fairly heavy on all varieties. Test weights were all above 61 pounds per bushel. Yogo was outstanding for yield with Nebred second. Kharkof and Marmin gave the lowest yields. Based on an 8-year average, Yogo ranks first for yield, while for the last 4-year period Nebred, Yogo, and Minard x Minhardi (C.I. 8888) are at the top.

At St. Paul lodging was severe for all varieties except Minard. Both leaf and stem rust were fairly heavy and test weights were all above 60 pounds per bushel. Minturki yielded the highest and Minard the lowest. For an average of yields for the last four years Minard x Minhardi (C.I. 8888), Minturki, and Marmin rank the highest.

Four varieties were grown at Grand Rapids, with Marmin giving the highest yield. Yields were much lower here than at the other Minnesota stations. Minturki and Yogo rank the highest in average yield for an average of the last three years.

Yields at Dickinson ranged from 8.0 bushels for Marmin to 1.2 bushels for Minard x Minhardi (C.I. 8888). Weights per bushel were very low with Yogo testing only 49.0 pounds. Based on an average of six years Turkey (C.I. 1558), Minturki, and Yogo have had a slight advantage in yield. During the last two years Marmin and Nebred have had average yields slightly above those for the other varieties in the test.

Only slight differences in winter survival were noted at Sheridan. Cheyenne and Kanred headed the earliest, or four days ahead of Yogo and Minard x Minhardi (C.I. 8888). Test weights per bushel were 60 pounds or more for all the varieties. Nebred, Kanred, and Kharkof gave the highest yields and Minturki the lowest. Kanred has had the highest average yield for a 10-year period, while for the last four years Cheyenne has had the highest average.

At Moccasin, only two plots of each variety were harvested due to very poor stands and a heavy growth of weeds in the plots not harvested. Yogo yielded the highest, followed by a number of new hybrid strains. Newturk, Karmont, Minturki, Marmin, and Nebred yielded in the order [illegible]ed. In light of the standard error of a difference only Nebred could possibly be considered [illegible] yielding significantly less than Yogo. Of the varieties grown for a period of years Yogo has the best yield record. Several new hybrids have shown some promise for the short period over which they have been tested.

Denton, Texas
(Four 1/44-acre plots)

Table 1. - Agronomic and other data for winter wheat varieties grown in replicated plots in cooperative experiments at 17 experiment stations in the hard red winter wheat area in 1940, and average yields for 1931-40

Variety or cross	C.I. number	Stand		Dates		Hgt.	Rust		Weight per bushel	Av. acre yield	Yield				No. of years grown	Percentage of Kharkof for same years
		Fall	Spring	Headed	Ripe		Leaf	Stem			Av. 1931-40	Rank	Av. 1938-40	Rank		
		(Pct.)	(Pct.)		June	(In.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)						
Kawvale x Tenmarq	11956	88	95	May 1	4	34	7	33	60.5	31.2	----	--	----	--	1	167.7
Chiefkan	11754	82	95	May 2	6	37	43	33	61.0	29.8	----	--	28.0	2	3	159.1
Kawvale x Tenmarq	11953	73	95	May 4	6	34	7	38	58.0	29.0	----	--	27.6	4	3	156.8
Early Blackhull	8856	75	95	April 23	May 29	35	63	15	61.0	28.8	----	--	27.0	5	8	123.4
Kawvale x Tenmarq	11669	60	90	April 30	5	35	13	40	60.0	27.7	----	--	27.8	3	3	158.0
Oro x Tenmarq	11673	75	95	April 28	4	34	15	40	60.0	27.4	----	--	29.1	1	3	165.3
Blackhull	6251	70	95	May 3	7	36	65	33	59.0	26.8	26.9	5	23.4	9	10	114.0
Martin x Tenmarq[3]	11823	65	90	May 5	7	36	25	60	55.0	25.2	----	--	----	--	2	124.6
Quivira	8886	60	90	April 29	3	36	20	30	60.0	24.8	31.3	1	24.7	7	10	132.6
Kawvale	8180	80	90	May 5	7	36	7	33	58.5	24.7	28.3	3	23.0	11	10	119.9
Martin x Tenmarq[3]	11805	65	90	May 5	7	37	25	60	56.5	24.6	----	--	25.2	6	3	143.2
Tenmarq	6936	60	80	May 5	8	37	45	70	55.0	24.1	30.4	2	24.2	8	10	128.8
Kanred	5146	60	90	May 6	7	36	75	55	56.0	23.0	27.8	4	21.7	13	10	117.8
Mediterranean (Campbell), T.S. 23250	----	93	95	May 1	6	38	50	73	55.0	20.8	----	--	23.1	10	4	127.4
Red May selection, T.S. 7250-1	----	93	95	April 29	1	30	30	73	54.5	19.9	----	--	----	--	1	107.0
Mediterranean selection	10086	73	90	May 2	4	36	10	75	55.0	19.7	24.8	7	21.0	14	10	105.1
Mediterranean selection	11525	90	95	May 1	4	38	13	83	58.0	18.6	----	--	19.9	16	9	107.6
Kharkof	1442	60	90	May 7	8	35	75	55	55.0	18.6	23.6	9	17.6	18	10	100.0
Clarkan	8858	60	75	May 6	7	37	30	80	56.5	18.2	----	--	22.9	12	7	120.1
Denton	8265	65	80	May 6	7	38	14	80	52.0	15.6	26.2	6	20.2	15	10	111.0
Fulcaster	6471	60	75	May 4	7	37	63	80	52.0	13.8	24.4	8	18.7	17	10	103.4

Standard error of a difference between the mean yields of any two varieties = 1.38 bushels.

Table 1. - (Continued)

Chillicothe, Texas
(Four plots)

Variety or cross	C.I. number	Date headed	Hgt. (In.)	Weight per bushel (Lbs.)	Av. acre yield (Bu.)	Yield Av. 1938-40	Yield Rank	No. of years grown	Percentage of Kharkof for same years
Kanred	5146	May 6	21	57	10.8	20.2	7	3	109.2
Oro x Tenmarq	11673	April 29	21	56	10.6	19.9	8	3	107.6
Quivira	8886	April 29	21	56	10.6	21.1	4	3	114.1
Early Blackhull	8856	April 22	20	58	10.3	17.6	16	3	95.1
Blackhull	6251	May 6	22	59	10.1	21.5	1	3	116.2
Tenmarq	6936	May 6	22	56	9.9	21.4	2	3	115.7
Cheyenne	8885	May 6	22	57	9.8	19.9	8	3	107.6
Kawvale x Tenmarq	11669	May 6	21	55	9.8	21.4	2	3	115.7
Turkey	1558	May 9	21	58	9.4	18.8	12	3	101.6
Martin x Tenmarq^3	11805	May 6	22	53	9.4	20.3	6	3	109.7
Turkey (Vaughn) (Texas No. 15133)	----	May 9	21	56	9.1	19.3	10	3	104.3
Denton	8265	May 6	22	55	8.9	18.8	12	3	101.6
Mediterranean	11587	May 6	22	55	8.6	19.3	10	3	104.3
Chiefkan	11754	May 6	22	56	8.5	20.4	5	3	110.3
Kharkof	1442	May 9	24	56	8.4	18.5	14	3	100.0
Martin x Tenmarq^3	11823	May 6	21	55	8.3	----	--	1	98.8
Kawvale	8180	May 6	22	54	8.3	17.8	15	3	96.2

Standard error of a difference between the mean yields of any two varieties = 1.07 bushels.

Bushland, Texas
(Four 1/55-acre plots)
(Dryland)

Variety or cross	C.I. number	Date Headed	Date Ripe	Weight per bushel (Lbs.)	Av. acre yield (Bu.)	Yield Av. 1931 '34, '37-40	Yield Rank	Yield Av. 1939-40	Yield Rank	No. of years grown	Percentage of Kharkof for same years
Chiefkan	11754	June 1	July 4	56.0	4.9	----	--	9.3	4	4	105.1
Martin x Tenmarq^3	11805	May 29	July 1	54.0	4.9	----	--	8.4	8	2	103.7
Kharkof	1442	June 3	July 5	55.5	4.5	14.9	1	8.1	10	6	100.0
Denton	8265	June 1	July 4	52.5	4.5	14.2	6	8.9	5	6	96.3
Cheyenne	8885	June 3	July 7	57.5	4.4	----	--	7.5	12	5	94.1
Quivira	8886	May 28	June 30	56.0	4.3	14.4	3	8.8	6	6	96.6
Tenmarq	6936	May 31	July 3	54.5	4.3	14.4	3	7.5	12	6	96.6
Oro x Tenmarq	11673	May 31	July 1	55.5	4.2	----	--	8.8	6	3	95.9
Turkey	1558	June 2	July 7	55.5	4.2	----	--	7.2	15	5	91.4
Kawvale x Tenmarq	11669	May 30	June 30	56.5	4.1	----	--	9.8	3	3	95.9
Early Blackhull	8856	May 26	June 30	59.0	4.0	----	--	11.1	1	5	94.7
Kanred	5146	June 3	July 3	55.0	4.0	14.4	3	7.9	11	6	96.6
Kawvale	8180	June 1	July 1	53.0	4.0	13.8	7	8.2	9	6	92.6
Blackhull	6251	May 31	July 3	57.5	3.9	14.9	1	10.2	2	6	100.0
Martin x Tenmarq^3	11823	May 31	July 2	52.0	3.3	----	--	7.4	14	2	91.4
Turkey (Vaughn)	----	June 4	July 8	55.0	3.2	----	--	6.4	16	5	90.8

Standard error of a difference between the mean yields of any two varieties = 0.37 bushels.

Table 1. - (Continued)

Lawton, Oklahoma

(Three plots; seeded October 11; emerged October 18, 1939)

Variety or cross	C.I. number	Date Headed	Date Ripe	Hgt.	Hail May 20 Broken culms	Stem rust	Weight per bushel	Average acre yield	Yield Av. 1931-34, '36-37 1940	Rank	Yield Av. 1937 and 1940	Rank	Number of years grown	Percentage of Kharkof for same years
			June	(In.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)						
Kawvale x Tenmarq	11669	May 1	6	24	5	T	61	22.4	----	--	----	--	1	111.4
Chiefkan	11754	May 3	9	30	10	10	62	22.3	----	--	28.3	1	2	108.4
Tenmarq	6936	May 3	10	29	13	15	60	22.2	25.5	2	27.9	2	7	104.1
Kanred	5146	May 4	10	28	11	10	60	22.0	25.2	3	27.3	6	7	102.9
Martin x Tenmarq[3]	11805	May 4	9	29	13	5	58	21.9	----	--	----	--	1	109.0
Cheyenne	8885	May 6	11	27	4	25	61	21.7	24.7	4	27.3	6	7	100.8
Oro x Tenmarq	11673	April 30	8	27	8	5	60	21.7	----	--	----	--	1	108.0
Blackhull	6251	May 3	10	29	10	5	61	21.5	24.7	4	27.4	5	7	100.8
Martin x Tenmarq[3]	11823	May 4	10	28	13	10	58	21.3	----	--	----	--	1	106.0
Kawvale x Tenmarq	11750	May 1	6	24	5	T	58	20.5	----	--	27.5	4	2	105.4
Oro x Tenmarq	11672	May 1	8	26	8	5	60	20.3	----	--	----	--	1	101.0
Kharkof	1442	May 6	12	27	11	20	60	20.1	24.5	6	26.1	11	7	100.0
Sibley 62	11523	May 5	10	26	10	10	60	19.9	----	--	26.4	8	4	102.8
Turkey	1558	May 9	12	27	10	20	59	19.6	23.9	7	24.8	17	7	97.6
Kanred x Marquis	11589	May 2	8	26	13	20	61	19.1	----	--	27.9	2	4	109.8
Penquite	11745	May 4	10	27	10	25	60	19.1	----	--	26.3	10	2	100.8
Iobred x Kawvale (La.35-95)	-----	May 5	10	27	2	20	60	18.9	----	--	25.2	14	2	96.6
Turkey x Kawvale (La.35-93)	-----	May 4	8	27	2	20	59	18.7	----	--	26.4	8	2	101.1
Clarkan	8858	May 4	10	31	10	20	61	18.5	----	--	25.5	13	3	100.0
Kawvale	8180	May 3	8	26	2	T	59	18.1	25.7	1	25.1	15	7	104.9
P-1066-1 x Prelude	11590	April 29	6	26	25	T	60	17.7	----	--	----	--	1	88.1
Fulcaster	6471	May 7	10	30	5	25	59	17.2	23.1	9	25.1	15	7	94.3
Early Blackhull	8856	April 24	5	28	10	2	61	16.9	22.7	10	25.8	12	7	92.7
Harvest Queen	6199	May 4	10	30	10	25	59	16.6	21.1	11	22.7	19	7	86.1
Denton	8265	May 5	10	27	10	20	58	15.4	23.2	8	23.7	18	7	94.7

Standard error of a difference between the mean yields of any two varieties = 1.20 bushels.

ble 1. - (Continued)

Stillwater, Oklahoma
(Four plots)

Variety or cross	C.I. number	Stand	Height	Weight per bushel	Average acre yield	Yield				No. of years grown	Percentage of Kharkof for same years
						Av. 1931-40	Rank	Av. 1939-40	Rank		
		(Pct.)	(In.)	(Lbs.)	(Bu.)						
Blackhull	6251	88	34	61.1	39.0	29.8 1/	1	38.9	2	9	101.0
Kharkof	1442	80	32	59.1	36.0	29.5	2	34.4	5	10	100.0
Kawvale x Tenmarq	11669	78	30	59.4	35.0	-----	-	39.6	1	2	115.1
Oro x Tenmarq	11673	60	31	59.9	34.5	-----	-	38.7	3	2	112.5
Chiefkan	11754	65	35	61.3	33.6	-----	-	36.7	4	4	102.6
Tenmarq	6936	70	34	58.5	33.5	29.5	2	33.7	6	10	100.0
Kawvale	8180	60	34	56.2	25.4	28.7	4	30.5	7	10	97.3
Early Blackhull	8856	50	29	61.8	25.3	25.6	5	29.4	8	10	86.8

1/ Excluding 1935.

Standard error of a difference between the mean yields of any two varieties = 2.79 bushels.

Table 1. - (Continued)

Woodward, Oklahoma

(Four 1/47-acre plots; seeded October 16, 1939; emerged November 24, 1939, through February 27, 1940)

Variety or cross	C.I. number	Survival (Pct.)	Date Headed May	Date Ripe June	Height (In.)	Weight per bushel (Lbs.)	Average acre yield (Bu.)	Yield Av.1931-34, 1936-40	Yield Rank	Yield Av. 1939-40	Yield Rank	No. of years grown	Percentage of Kharkof for same years
Kawvale x Tenmarq	11669	68	19	20	23	56	23.2	----	--	32.7	1	3	130.2
Chiefkan	11754	71	20	23	25	58	22.9	----	--	32.2	2	4	120.5
Oro x Tenmarq	11673	79	19	20	23	55	21.7	----	--	29.6	4	3	110.6
Tenmarq x Nebraska 28	11847	78	22	25	24	58	21.3	----	--	28.9	7	3	110.9
Quivira	8886	70	19	20	23	57	20.4	27.5	1	29.6	4	9	101.9
Blackhull	6251	56	22	22	25	58	20.3	25.7	7	29.4	6	9	95.2
Sibley 62	11523	54	26	25	24	52	18.5	----	--	28.6	9	6	97.4
Early Blackhull	8856	79	14	19	23	59	18.3	24.3	10	28.3	13	9	90.0
Turkey (Local)Wd.1008	-----	79	26	25	22	57	18.2	26.2	5	28.4	12	9	97.0
Blackhull x Oro	11961	63	22	25	25	54	18.2	----	--	27.6	14	2	96.5
Cheyenne	8885	79	25	25	22	58	17.9	26.9	4	30.4	3	9	99.6
Kharkof	1442	69	26	25	23	57	17.7	27.0	2	28.6	9	9	100.0
Oro	8220	58	27	25	24	56	17.4	25.2	9	28.9	7	9	93.3
Kanred	5146	71	26	25	23	57	17.3	25.8	6	28.6	9	9	95.6
Denton	8265	76	26	26	24	54	17.2	22.8	11	26.4	15	9	84.4
Kawvale	8180	58	25	25	23	56	16.4	25.7	7	25.3	18	9	95.2
Tenmarq	6936	76	22	21	23	51	16.0	27.0	2	26.2	16	9	100.0
Turkey selection	10016	79	22	20	22	55	15.8	----	--	25.6	17	6	96.5

Standard error of a difference between the mean yields of any two varieties = 1.64 bushels.

ble 1. - (Continued)

Goodwell, Oklahoma
(Three 1/38-acre plots)

Variety or cross	C.I. number	Date headed	Weight per bushel (Lbs.)	Average acre yield (Bu.)	Yield				No. of years grown	Percentage of Kharkof for same years
					Av. 1931-32, '34, '35, '39-40	Rank	Av. 1939-40	Rank		
Early Blackhull	8856	May 31	60	23.0	19.0	6	19.2	1	6	76.6
Chiefkan	11754	June 8	57	20.6	----	-	17.0	5	2	106.3
Kawvale x Tenmarq	11669	June 9	54	20.5	----	-	17.5	4	2	109.4
Oro x Tenmarq	11673	June 8	54	20.3	----	-	18.3	2	2	114.4
Blackhull	6251	June 9	57	19.5	24.1	2	17.6	3	6	97.2
Tenmarq	6936	June 9	52	18.8	22.3	4	16.7	6	6	89.9
Kanred	5146	June 12	54	16.5	23.4	3	15.1	8	6	94.4
Kharkof	1442	June 12	52	16.4	24.8	1	16.0	7	6	100.0
Kawvale	8180	June 13	51	15.3	19.9[1]	5	----	-	5	74.5

1/ Excluding 1939.

Standard error of a difference between the mean yields of any two varieties = 1.27 bushels.

Table 1. - (Continued)

Manhattan, Kansas
(Three 1/40-acre plots)

Variety or cross	C.I. number	Date Headed (May)	Date Ripe (June)	No. of culms per A. (1000)	Hgt. (In.)	Wt. 100 10 Cm. sections, straw (Grams)	Stem rust 1/ (Pct.)	Weight per bushel (Lbs.)	Average acre yield (Bu.)	Yield Av. 1931-38, 1940	Yield Rank	Yield Av. 1937-38 & 1940	Yield Rank	No. of years grown	Percentage of Kharkof for same years
Kawvale x Tenmarq	11669	13	23	2478	33	6.2	T	59.4	32.2	----	-	37.2	1	3	155.6
Early Blackhull x Tenmarq	11952	12	23	1754	33	7.8	T	61.9	31.1	----	-	----	-	1	127.5
Cheyenne x Tenmarq	11972	18	25	2062	35	6.4	T	61.0	30.4	----	-	----	-	1	124.6
Chiefkan	11754	18	25	1841	41	6.8	5	62.0	29.9	----	-	31.6	5	3	132.2
Kawvale x Tenmarq	11750	13	23	2075	34	6.7	T	59.5	29.9	----	-	34.7	2	3	145.2
Tenmarq	6936	14	24	1900	37	6.7	T	59.8	29.8	35.3	5	30.7	8	9	110.3
Quivira	8886	13	23	1914	36	6.6	T	60.0	29.4	36.1	2	32.3	4	9	112.8
Cheyenne x Tenmarq	11973	14	24	2063	34	6.3	T	61.7	29.3	----	-	----	-	1	120.1
Cheyenne x Tenmarq	12104	13	24	1971	34	6.6	T	61.0	29.3	----	-	----	-	1	120.1
Kanred x Marquis	11589	14	23	1941	35	6.9	T	60.9	29.0	----	-	31.6	5	7	112.8
Blackhull	6251	18	25	2134	41	6.2	T	61.3	28.7	34.8	6	28.8	9	9	108.8
Oro x Tenmarq	11673	14	23	1860	36	7.0	T	59.8	28.6	----	-	33.0	3	3	138.1
Cheyenne x Tenmarq	12103	18	25	2166	35	6.5	T	60.4	28.5	----	-	----	-	1	116.8
Nebred	10094	19	25	2381	35	5.7	T	61.0	28.3	----	-	28.4	11	5	116.9
Oro x Tenmarq	11672	14	23	1858	35	6.9	T	59.6	28.1	----	-	31.6	5	3	132.2
Kawvale	8180	17	24	1938	39	7.0	2	58.2	27.8	37.0	1	28.8	9	9	115.6
Clarkan	8858	18	25	1680	43	7.6	15	60.9	26.8	35.5	3	27.2	13	9	110.9
Early Blackhull	8856	10	22	1816	35	6.8	T	61.0	26.2	33.9	8	26.3	15	9	105.9
Kanred (Ft. Collins) 1921 seed	5146	19	25	2028	38	6.4	T	60.1	26.1	----	-	----	-	1	107.0
Cheyenne	8885	19	25	2007	35	6.2	T	61.1	26.0	35.5	3	26.4	14	9	110.9
Fulcaster	6471	17	25	1884	41	6.9	15	60.2	26.0	34.0	7	25.4	17	9	106.3
Turkey (Farm)	1558	19	25	2070	38	5.8	T	60.3	25.7	----	-	----	-	1	105.3
Harvest Queen	6199	18	25	1743	44	7.7	15	59.5	25.3	29.2	13	22.2	20	9	91.3
Turkey (Plot)	1558	19	26	2074	39	6.0	T	60.9	25.2	33.4	9	26.3	15	9	104.4
Kanred (Manhattan)	5146	19	25	2012	38	5.9	T	60.0	24.7	33.0	10	27.7	12	9	103.1
Kanred (Ft. Collins) 1938 seed	5146	19	25	1966	38	5.9	T	59.8	24.6	----	-	----	-	1	100.8
Kharkof	1442	19	26	2056	37	6.3	T	60.8	24.4	32.0	12	23.9	19	9	100.0
Oro	8220	19	26	1961	38	6.4	T	61.0	23.5	32.9	11	24.9	18	9	102.8

1/ Notes on disease reaction obtained in cooperation with members of the Department of Plant Pathology.

Standard error of a difference between the mean yields of any two varieties = 1.25 bushels.

Table 1. - (Continued)

Hays, Kansas

(Four 1/50-acre plots - 2 on fallow, 2 on cropped land; seeded Oct. 10, 1939; emerged March 18, 1940)

Variety or cross	C.I. number	Date Headed	Date Ripe	Hgt.	Tillers per 200 ft. row	Weight per bushel	Average acre yield	Yield Av. 1931-34, 1936-40	Rank	Yield Av. 1939-40	Rank	No. of years grown	Percentage of Kharkof for same years
			June	(In.)		(Lbs.)	(Bu.)	(Bushels)		(Bu.)			
Oro x Tenmarq	11672	May 24	28	23	3731	60	17.8	----	-	15.4	5	3	113.6
Oro x Tenmarq	11673	May 25	28	24	3737	59	17.8	----	-	16.3	2	4	122.0
Chiefkan	11754	May 25	28	25	3896	62	17.4	----	-	16.6	1	5	129.5
Early Blackhull	8856	May 21	24	24	3440	62	17.3	23.0	2	16.2	3	9	119.2
Early Blackhull hybrid	11846	May 26	28	24	3811	59	16.7	----	-	14.3	9	2	117.2
Kawvale x Tenmarq	11669	May 25	28	23	4423	59	16.3	----	-	15.6	4	3	157.4
Kanred x Marquis	11589	May 29	28	24	3508	59	15.9	----	-	15.4	5	5	122.8
Blackhull selection, H.C.369	------	May 28	29	24	4344	59	15.6	----	-	----	-	2	94.7
Tenmarq	6936	May 28	28	24	3916	58	15.1	23.4	1	15.3	7	9	121.2
Blackhull	6251	May 27	29	24	4195	60	14.5	22.4	3	13.3	11	9	116.1
Kawvale x Tenmarq	11750	May 25	28	23	3987	56	14.2	----	-	14.4	8	2	118.0
Nebred	10094	June 1	30	20	5103	58	14.0	----	-	13.4	10	5	107.3
Kanred	5146	June 1	30	24	4317	58	13.1	20.2 1/	6	12.3	13	8	109.2
Oro	8220	June 1	30	24	4354	58	13.1	20.5	5	12.5	12	9	106.2
Turkey	1558	June 1	30	23	4603	58	12.4	19.9	7	12.1	15	9	103.1
Cheyenne	8885	June 3	30	22	4463	60	12.1	21.8	4	11.3	16	9	113.0
Kharkof	1442	June 1	30	24	4212	57	11.9	19.3	8	12.2	14	9	100.0

1/ Excluding 1937.

Standard error of a difference between mean yields of any two varieties = 0.75 bushels.

Table 1. - (Continued)

Lincoln, Nebraska
(Five 1/40-acre plots; seeded Oct. 9; emerged Oct. 16, 1939)

Variety or cross	C.I. number	Date Headed	Date Ripe	Height	Weight per bushel	Average acre yield	Yield Av. 1930-40	Rank	Yield Av. 1938-40	Rank	No. of years grown	Percentage of Kharkof for same years
		May	June	(In.)	(Lbs.)	(Bu.)	(Bu.)		(Bu.)			
Kawvale x Tenmarq	11669	26	26	23	59.9	22.7	-----	-	22.0	1	5	115.9
Do	11992	27	26	25	57.6	21.2	-----	-	-----	-	2	123.1
Do	11750	27	26	23	57.9	21.2	-----	-	-----	-	2	123.7
Turkey selection	10016	28	26	23	60.8	20.3	27.4	7	18.0	11	11	99.6
Blackhull	6251	29	28	26	61.5	20.1	27.9	5	18.6	6	11	101.5
Kawvale x Tenmarq (Nebr.No.1113)	-----	26	26	23	58.8	20.0	-----	-	-----	-	2	122.0
Blackhull selection	11737	29	28	26	62.8	19.9	-----	-	18.2	10	4	106.0
Oro x Tenmarq	11673	26	27	25	59.6	19.5	-----	-	19.8	3	3	116.5
Cheyenne	8885	31	28	23	63.0	19.4	30.1	1	18.6	6	11	109.5
Kawvale x Tenmarq (Nebr.No.1104)	-----	27	28	24	58.9	19.1	-----	-	-----	-	1	139.4
Chiefkan	11754	28	28	25	62.4	18.8	-----	-	20.6	2	3	121.2
Oro x Tenmarq	11672	26	27	25	59.6	18.7	-----	-	-----	-	2	120.2
Kanred x Blackhull	11844	29	29	24	59.8	18.5	-----	-	18.5	8	3	108.8
Cheyenne selection	11666	31	28	23	61.8	18.1	-----	-	18.8	5	5	105.1
Turkey (Nebr. No. 1)	-----	31	29	24	60.8	17.9	27.0	8	16.9	17	11	90.2
Iobred selection (Iowa 2473)	11997	30	28	25	61.9	17.8	-----	-	-----	-	1	129.9
Clarkan	8858	30	29	27	62.2	17.8	-----	-	19.0	4	6	108.2
Minturki x Blackhull (Sel.31-A-899)	-----	30	29	24	61.4	17.6	-----	-	-----	-	1	128.5
Tenmarq	6936	29	27	24	59.3	17.4	28.9	2	17.7	13	11	105.1
Turkey selection	11577	30	28	22	59.6	16.7	-----	-	17.9	12	6	103.6
Tenmarq x Minturki	11580	29	28	22	59.1	16.2	-----	-	18.3	9	4	101.8
Kawvale	8180	30	29	23	57.3	15.7	28.7	3	16.6	19	11	104.4
Turkey (Nebr. No. 312)	-----	30	28	22	60.6	15.7	26.3	10	17.0	15	11	95.6
Nebred	10094	31	27	20	60.7	15.1	28.4	4	17.4	14	11	103.3
Turkey selection	11735	30	28	22	61.6	14.7	-----	-	-----	-	1	107.3
Nebraska No. 60	6250	June 1	29	21	61.5	14.4	26.0	11	16.1	20	11	94.5
Iobred	6934	31	28	23	62.3	14.3	-----	-	-----	-	5	88.1
Kanred	5146	31	29	21	61.0	14.2	27.0	8	16.7	18	11	98.2
Kharkof	1442	31	28	22	61.1	13.7	27.5	6	17.0	15	11	100.0

Standard error of a difference between the mean yields of any two varieties = 3.14 bushels.

Table 1. - (Continued)

North Platte, Nebraska
(Two 1/40-acre plots; fallow only)

Variety or cross	C.I. number	Date Headed	Date Ripe	Height	Weight per bushel	Average acre yield	Yield Av. 1931-36, 1938-40	Rank	Yield Av. 1939-40	Rank	No. of years grown	Percentage of Kharkof for same years
				(In.)	(Lbs.)	(Bu.)	(Bushels)		(Bushels)			
Turkey selection	11577	June 1	June 29	21	59.0	14.7	----	-	----	-	1	121.5
Cheyenne selection	11666	June 3	June 30	19	60.0	14.6	----	-	21.3	1	4	111.7
Blackhull	6251	June 2	June 30	18	59.5	13.9	22.5	5	18.2	7	9	99.6
Kanred x Blackhull	11844	May 31	June 28	20	59.0	13.3	----	-	----	-	1	109.9
Kanred	5146	June 4	July 1	20	59.5	13.0	21.9	9	18.5	6	9	96.9
Nebred	10094	June 2	June 30	17	60.0	12.6	----	-	19.3	5	7	103.6
Oro	8220	June 4	July 2	19	59.5	12.5	22.5	5	19.5	3	9	99.6
Kharkof	1442	June 4	July 2	19	59.0	12.1	22.6	3	18.2	7	9	100.0
Nebraska No. 60	6250	June 5	July 2	21	59.0	11.7	22.9	2	19.4	4	9	101.3
Tenmarq	6936	June 2	June 30	17	60.0	11.1	22.4	7	16.1	16	9	99.1
Chiefkan	11754	June 1	June 28	20	59.0	11.1	----	-	16.6	11	3	98.8
Cheyenne	8885	June 3	July 1	16	60.0	10.8	23.9	1	19.8	2	9	105.8
Beloglina x Hussar	11664	June 5	July 2	19	58.5	10.5	----	-	16.2	15	5	92.2
"Alton"	----	June 5	July 1	21	58.0	10.3	----	-	16.1	16	3	80.5
Turkey (local)	----	June 1	June 30	17	59.5	10.0	22.6	3	16.8	10	9	100.0
Beloglina selection	8884	June 4	July 1	18	59.0	9.6	21.9	9	16.3	14	9	96.9
Oro x Tenmarq	11673	May 30	June 29	21	59.0	9.0	----	-	16.6	11	3	95.3
Turkey selection	10016	June 1	June 29	17	59.0	8.7	22.4	7	16.5	13	9	99.1
Beloglina x Hussar	11513	June 3	June 30	16	59.5	8.5	----	-	17.4	9	3	92.9
Oro x Tenmarq	11672	May 30	June 29	20	59.5	8.3	----	-	15.8	18	2	86.8
Kawvale x Tenmarq	11669	May 29	June 28	19	59.0	7.8	----	-	14.9	20	3	95.9
Kawvale x Tenmarq	11750	May 30	June 28	19	58.5	6.1	----	-	15.7	19	2	86.3

Standard error of a difference between the mean yields of any two varieties = 1.98 bushels.

Table 1. - (Continued)

Waseca, Minnesota
(Three 1/40-acre plots)

Variety or cross	C.I. number	Date Headed	Date Ripe	Hgt.	Lodging Percent	Lodging Degree	Rust Stem	Rust Leaf	Texture	Plumpness	Weight per bushel	Av. acre yield	Yield Av. 1931-33, '35, '37-40	Rank	Yield Av. 1937-40	Rank	No. of years grown	Percentage of Kharkof for same years
		June	July	(In.)			(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)	(Bu.)		(Bu.)			
Yogo	8033	11	16	44	98	30	30SR	60	75	95	62.3	60.5	37.2	1	36.3	2	8	108.1
Nebred	10094	9	14	37	45	14	50SR	25	65	95	63.2	54.2	-----	-	36.8	1	4	116.5
Minard x Minhardi	8888	11	16	41	50	20	60SR	20	75	95	63.3	52.8	36.6	2	36.2	3	8	106.4
Minturki	6155	11	17	45	30	22	25SR	60	70	95	61.7	49.7	35.6	3	34.1	4	8	103.5
Kharkof	1442	9	16	40	82	20	70	20	58	90	62.1	47.4	34.4	4	31.6	6	8	100.0
Marmin	11502	9	16	45	58	19	30SR	60	70	95	62.0	47.3	-----	-	33.7	5	6	103.9

Standard error of a difference between the mean yields of any two varieties = 3.78 bushels.

St. Paul, Minnesota
(Three 1/40-acre plots)

Variety or cross	C.I. number	Date Headed	Date Ripe	Height	Lodged	Rust Stem	Rust Leaf	Texture	Plumpness	Weight per bushel	Average acre yield	Average yield 1937-40	Rank
		June	July	(In.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)	(Bushels)	
Minturki	6155	12	17	42	70	47	58	65	95	61.3	55.2	37.3	2
Minard x Minhardi	8888	10	17	41	53	52	42	75	95	61.8	52.0	37.8	1
Marmin	11502	11	17	42	78	60	53	65	95	61.2	48.0	36.2	3
Minhardi	5149	12	18	42	40	93	77	55	95	60.4	47.6	32.5	4
Minard 1/	6690	11	16	47	10	50	15	60	95	60.1	42.7	28.7	5

1/ Only one plot.

Standard error of a difference between the mean yields of any two varieties = 4.47 bushels.

Table 1. - (Continued)

Grand Rapids, Minnesota
(Three 1/40-acre plots)

Variety or cross	C.I. number	Date Headed	Date Ripe	Height	Rust Stem	Rust Leaf	Texture	Plumpness	Weight per bushel	Average acre yield	Average yield 1938-40	Rank
		June	July	(In.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)	(Bushels)	
Marmin	11502	23	28	33	38	22	78	95	61.7	27.6	22.4	3
Minturki	6155	24	23	33	22	7	75	95	61.7	26.6	25.2	1
Yogo	8033	25	30	31	18	18	78	95	61.8	26.5	24.6	2
Minard x Minhardi	8888	26	30	28	37	15	80	95	61.9	20.5	20.4	4

Standard error of a difference between the mean yields of any two varieties = 3.10 bushels.

Dickinson, North Dakota
(Two 1/40-acre plots; seeded Sept. 15, 1939; emerged May 1, 1940)

Variety or cross	C.I. number	Date Headed	Date Ripe	No. of plants per acre	Height	Weight per bushel	Average acre yield	Yield Av. 1932-33, '35-36, '39-40	Rank	Yield Av. 1939-40	Rank	No. of years grown	Percentage of Kharkof for same years
		June		(1000)	(In.)	(Lbs.)	(Bu.)	(Bushels)		(Bushels)			
Marmin	11502	24	July 31	230	29	54.0	8.0	----	-	13.5	1	2	146.7
Nebred	10094	23	July 29	280	26	54.0	6.9	----	-	11.6	2	2	126.1
Turkey	1571	25	Aug. 1	292	28	51.5	4.3	8.4	1	9.2	5	6	112.0
Nebraska No. 60	6250	26	Aug. 1	202	27	53.0	4.3	7.7	4	7.8	9	6	102.7
Karmont	6700	27	Aug. 2	264	28	52.0	4.2	7.2	7	8.0	8	6	96.0
Kharkof	1442	27	Aug. 2	334	28	50.5	4.0	7.5	6	9.2	5	6	100.0
Minturki	6155	26	Aug. 1	240	27	50.0	3.1	8.4	1	9.7	3	6	112.0
Beloglina	1543	27	Aug. 2	242	28	54.5	2.1	7.6	5	7.1	10	6	101.3
Yogo	8033	27	Aug. 1	142	28	49.0	1.7	8.3	3	8.7	7	6	110.7
Minard x Minhardi	8888	27	Aug. 1	184	28	51.8	1.2	----	-	9.5	4	3	103.2

Standard error of a difference berween the mean yields of any two varieties = 0.77 bushels.

Table 1. - (Continued)

Sheridan, Wyoming
(Three 1/55-acre plots; seeded Sept. 22, 1939; emerged Oct. 9, 1939)

Variety or cross	C.I.No.	Survival (Pct.)	Date Headed June	Date Ripe July	Height (In.)	Weight per bushel (Lbs.)	Average acre yield (Bu.)	Yield Average 1931-40 (Bushels)	Yield Rank	Yield Average 1937-40 (Bushels)	Yield Rank	No. of years grown	Percentage of Kharkof for same years
Nebred	10094	80	6	9	34	62	37.6	----	-	35.2	4	4	101.4
Kanred	5146	82	4	9	37	61	37.6	28.5	1	35.5	3	10	105.9
Kharkof	1442	82	6	9	36	61	37.0	26.9	5	34.7	5	10	100.0
Cheyenne	8885	85	4	10	35	61	35.8	----	-	37.5	1	6	113.6
Nebraska No. 60	6250	82	6	11	36	60	35.8	28.4	2	36.7	2	10	105.6
Montana No. 36	5549	80	6	10	36	61	35.7	28.0	3	34.0	6	10	104.1
Yogo	8033	80	8	9	36	60	33.6	27.2	4	33.3	7	10	101.1
Minard x Minhardi	8888	82	8	10	34	61	33.3	----	-	32.7	8	5	94.8
Karmont	6700	80	6	9	35	60	33.0	26.1	6	31.2	11	10	97.0
Marmin	11502	82	6	11	37	60	33.0	----	-	31.4	10	5	91.4
Minturki	6155	80	6	10	37	60	31.5	24.4	7	31.9	9	10	90.7

Standard error of a difference between the mean yields of any two varieties = 2.12 bushels.

Table 1. - (Continued)

Moccasin, Montana
(Two 1/50-acre plots; seeded September 11, 1939)

Variety or cross	C.I. no.	Survival (Pct.)	Date Headed June	Date Ripe July	Height (In.)	Bunt (Pct.)	Weight per bushel (Lbs.)	Average acre yield (Bu.)	Yield Av.1931-35, 1937-40 (Bushels)	Rank	Yield Av. 1937-40 (Bushels)	Rank	No. of years grown	Percentage of Kharkof for same years
Yogo	8033	52	20	21	36	8	56.0	17.1	19.6	1	23.4	1	9	112.6
Minturki x Beloglina-Buffum	11681	52	21	21	36	18	56.0	16.9	-----	-	21.9	4	4	105.3
Eureka x Minhardi	8036	46	20	21	35	85	57.0	16.8	19.2	2	21.5	6	9	110.3
Turkey x Kanred	11725	51	21	20	35	83	55.0	16.8	-----	-	23.2	2	4	111.5
Mont.36-Bel.1667 x Kanred, B.H.31-143	-----	48	18	20	34	20	59.5	16.2	-----	-	-----	-	1	136.1
Newturk x Kar.-Bel.1667, B.H.39-9	-----	59	18	20	36	6	57.0	16.2	-----	-	-----	-	1	136.1
Minard x Minhardi	8888	55	20	21	34	50	57.5	16.2	-----	-	21.2	8	8	101.5
Kanred x Minhardi	11726	49	21	22	34	80	57.0	15.7	-----	-	21.6	5	4	103.8
Yogo x Oro, Selection 5	-----	48	21	22	36	9	56.0	15.3	-----	-	-----	-	1	128.6
Newturk	6935	36	19	21	35	80	57.0	15.2	18.2	3	22.5	3	9	104.6
Compound hybrid, B.H.32-33	-----	44	19	20	36	3	58.0	14.2	-----	-	-----	-	1	119.3
Karmont	6700	39	20	21	33	60	58.0	12.9	17.7	4	21.5	6	9	101.7
Turkey	1558	39	20	21	32	65	58.0	12.9	17.5	5	21.1	9	9	100.6
Minturki	6155	41	21	22	34	23	57.0	12.2	17.1	7	20.6	11	9	98.3
Kharkof	1442	41	20	22	32	60	57.0	11.9	17.4	6	20.8	10	9	100.0
Marmin	11502	43	20	22	34	7	58.0	11.8	-----	-	-----	-	2	89.9
Nebred	10094	39	19	21	31	3	57.5	10.1	-----	-	18.9	12	4	90.9

Standard error of a difference between the mean yields of any two varieties = 3.33 bushels.

STANDARD ERRORS

Standard errors have been calculated for yields where possible. The accuracy of these errors may be open to question since the plots were not randomized at all of the stations. Random arrangements were used at the Texas and 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 1940 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 $\sqrt{2}$.

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

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

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 test at each cooperating station, 1940

Station	Number of plots	Average yield of varieties (Bushels)	Standard error of a			
			Difference between means (Bushels)	Single plot (Bushels)	Mean in Bushels	Mean in Percent
Texas:						
Denton	4	23.43	1.38	1.96	0.98	4.16
Chillicothe	4	9.49	1.07	1.52	0.76	8.01
Bushland	4	4.15	0.37	0.52	0.26	6.27
Oklahoma:						
Woodward	4	18.80	1.64	2.32	1.16	6.17
Goodwell	3	18.99	1.27	1.56	0.90	4.74
Stillwater	4	32.76	2.79	3.96	1.98	6.04
Lawton	3	19.77	1.20	1.47	0.85	4.30
Kansas:						
Manhattan	3	27.71	1.25	1.54	0.89	3.20
Hays	4	14.99	0.75	1.06	0.53	3.54
Nebraska:						
Lincoln	5	17.82	3.14	4.96	2.22	12.46
North Platte	2	10.89	1.98	2.80	1.40	12.86
Minnesota:						
Waseca	3	51.98	3.78	4.62	2.67	5.14
St. Paul	3	50.11	4.47	5.47	3.16	6.23
Grand Rapids	3	25.28	3.10	3.79	2.19	8.63
North Dakota:						
Dickinson	2	3.98	0.77	1.10	0.55	13.67
Wyoming:						
Sheridan	3	34.89	2.12	2.60	1.50	4.30
Montana:						
Moccasin	2	14.64	3.33	4.72	2.36	16.11

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 1940 and the 1931-39 averages where available are presented in tables 3 to 8.

In the southern district in 1940 yields were reported from seven stations where nine varieties were grown uniformly, except that Kanred was not reported from Stillwater. The data are shown in table 3 where the varieties are listed in order of average yield. Kawvale x Tenmarq (C.I. 11669) and Chiefkan had the highest average yields. Oro x Tenmarq (C.I. 11673) had an average slightly above that of Tenmarq and Early Blackhull was slightly below. Kawvale and Kanred were at the bottom of the list.

In order to show the behavior of some of the newer varieties the average yields for the period 1938-40 are summarized for nine varieties in table 4. The varieties are listed in order of the weighted average yield based on the results of 17 station-year tests. Kawvale x Tenmarq (C.I. 11669) has the highest average followed by Oro x Tenmarq (C.I. 11673), Chiefkan, and Blackhull. Kharkof and Kanred, the latest varieties in the group had the lowest yields.

For the central district, data were reported from four stations only in 1940 (table 5). Kawvale x Tenmarq (C.I. 11669), Chiefkan, and Blackhull had the highest average yields. Tenmarq ranked fifth, while Nebred, Cheyenne, Kanred, and Kharkof were at the bottom of the list. The lack of winterkilling and the dry season explain the fact that the early tender varieties outyielded the later, more hardy ones. In table 6 the average yields for the last three years for eight varieties grown at four stations are summarized. The same three varieties that were high in the southern district ranked the highest, namely, Kawvale x Tenmarq (C.I. 11669), Chiefkan, and Oro x Tenmarq (C.I. 11673). At the bottom of the list are Nebred, Cheyenne, and Kharkof.

The yields obtained in the northern district in 1940 are presented in table 7. Data were reported from six stations, with three varieties being grown uniformly. For the average yields from the six stations, Minturki has a slight advantage over Marmin and Kharkof. Excluding St. Paul and Grand Rapids data from the averages, Yogo ranks highest with Nebred second and Minard x Minhardi (C.I. 8888) third. Marmin and Minturki averaged below Kharkof. Over a 4-year period at four stations (table 8) Yogo and Nebred rank first and second, respectively, closely followed by Marmin and Minard x Minhardi (C.I. 8888).

Table 3. - Summary of average yields of the uniform winter wheat varieties grown in plot tests at 7 stations in the southern district, 1940

Variety or cross	C.I. number	Average yield in bushels per acre at:							Average
		Denton	Bushland	Chillicothe	Woodward	Goodwell	Lawton	Stillwater	
Kawvale x Tenmarq	11669	27.7	4.1	9.8	23.2	20.5	22.4	35.0	20.4
Chiefkan	11754	29.8	4.9	8.5	22.9	20.6	22.3	33.6	20.4
Blackhull	6251	26.8	3.9	10.1	20.3	19.5	21.5	39.0	20.2
Oro x Tenmarq	11673	27.4	4.2	10.6	21.7	20.3	21.7	34.5	20.1
Tenmarq	6936	24.1	4.3	9.9	16.0	18.8	22.2	33.5	18.4
Early Blackhull	8856	28.8	4.0	10.3	18.3	23.0	16.9	25.3	18.1
Kharkof	1442	18.6	4.5	8.4	17.7	16.4	20.1	36.0	17.4
Kawvale	8180	24.7	4.0	8.3	16.4	15.3	18.1	25.4	16.0
Kanred	5146	23.0	4.0	10.8	17.3	16.5	22.0	-----	15.6 1/
Standard error of a mean (bushels)		0.98	0.26	0.76	1.16	0.90	0.85	1.98	0.41
Standard error of a mean (percent)		4.16	6.27	8.01	6.17	4.74	4.30	6.04	2.20

1/ Excluding Stillwater.

Table 4. - Summary of average yields of 9 uniform winter wheat varieties grown in plot tests at 7 stations in the southern district for a part or all of the period 1938-40

Variety or cross	C.I. number	Average yield in bushels per acre at: Denton	Chilli-cothe	Bush-land	Lawton	Good-well	Wood-ward	Still-water	Weighted average
Number of years grown		3	3	3	1	2	3	2	
Kawvale x Tenmarq	11669	27.8	21.4	13.9	22.4	17.5	40.5	39.6	26.3
Oro x Tenmarq	11673	29.1	19.9	13.9	21.7	18.3	34.4	38.7	25.2
Chiefkan	11754	28.0	20.4	14.8	22.3	17.0	35.8	36.7	25.1
Blackhull	6251	23.4	21.5	14.6	21.5	17.6	29.1	38.9	23.5
Tenmarq	6936	24.2	21.4	12.7	22.2	16.7	31.2	33.7	23.0
Kawvale	8180	23.0	17.8	13.8	18.1	19.9 1/	31.9	30.5	22.4
Early Blackhull	8856	27.0	17.6	14.5	16.9	19.2	27.9	29.4	22.1
Kharkof	1442	17.6	18.5	14.5	20.1	16.0	31.1	34.4	21.5
Kanred	5146	21.7	20.2	13.3	22.0	15.1	31.2	31.4 1/	21.4

1/ One year only.

Table 5. - Summary of average yields of 11 winter wheat varieties grown in test plots at 4 stations in the central district, 1940

Variety or cross	C.I. number	Average yield in bushels per acre at: Hays	Manhattan	Lincoln	North Platte	Average
Kawvale x Tenmarq	11669	16.3	32.2	22.7	7.8	19.8
Chiefkan	11754	17.4	29.9	18.8	11.1	19.3
Blackhull	6251	14.5	28.7	20.1	13.9	19.3
Oro x Tenmarq	11673	17.8	28.6	19.5	9.0	18.7
Tenmarq	6936	15.1	29.8	17.4	11.1	18.4
Oro x Tenmarq	11672	17.8	28.1	18.7	8.3	18.2
Kawvale x Tenmarq	11750	14.2	29.9	21.2	6.1	17.9
Nebred	10094	14.0	28.3	15.1	12.6	17.5
Cheyenne	8885	12.1	26.0	19.4	10.8	17.1
Kanred	5146	13.1	24.7	14.2	13.0	16.3
Kharkof	1442	11.9	24.4	13.7	12.1	15.5
Standard error of a mean (bushels)		0.53	0.89	2.22	1.40	0.71
Standard error of a mean (percent)		3.54	3.20	12.46	12.86	4.63

Table 6. - Summary of average yields of 8 uniform winter wheat varieties grown in plot tests at 4 stations in the central district for a part of the period, 1937-40

Variety or cross	C.I. number	Average yield in bushels per acre at: Manhattan	Hays	Lincoln	North Platte	Weighted average
Number of years grown		3	3	3	3	
Kawvale x Tenmarq	11669	37.2	24.4	22.0	16.2	25.0
Chiefkan	11754	31.6	21.3	20.6	16.7	22.6
Oro x Tenmarq	11673	33.0	20.7	19.8	16.1	22.4
Tenmarq	6936	30.7	19.6	17.7	15.0	20.8
Blackhull	6251	28.8	16.7	18.6	16.5	20.2
Nebred	10094	28.4	16.3	17.4	17.4	19.9
Cheyenne	8885	26.4	15.3	18.6	18.7	19.8
Kharkof	1442	23.9	15.5	17.0	16.9	18.3

Table 7. - Summary of average yields of 6 varieties of winter wheat grown in plot tests at 6 stations in the northern district, 1940

Variety or cross	C.I. no.	Average yield in bushels per acre at: St. Paul	Waseca	Grand Rapids	Sheridan	Dickinson	Moccasin	Average all stations	Average 1/
Yogo	8033	----	60.5	26.5	33.6	1.7	17.1	----	28.2
Nebred	10094	----	54.2	----	37.6	6.9	10.1	----	27.2
Minard x Minhardi	8888	52.0	52.8	20.5	33.3	1.2	16.2	29.3	25.9
Kharkof	1442	----	47.4	----	37.0	4.0	11.9	----	25.1
Marmin	11502	48.0	47.3	27.6	33.0	8.0	11.8	29.3	25.0
Minturki	6155	55.2	49.7	26.6	31.5	3.1	12.2	29.7	24.1
Standard error of a mean (bushels)		3.16	2.67	2.19	1.50	0.55	2.36	0.91	0.98
Standard error of a mean (percent)		6.23	5.14	8.63	4.30	13.67	16.11	4.10	5.54

1/ Excluding St. Paul and Grand Rapids.

Table 8. - Summary of average yields of 6 uniform winter wheat varieties grown in plot tests at 6 stations in the northern district for a part or all of the period, 1937-40

Variety or cross	C.I. number	Average yield in bushels per acre at: Waseca	St. Paul	Grand Rapids	Dickinson	Sheridan	Moccasin	Weighted 2/ average
Number of years grown		4	4	3	2	4	4	
Yogo	8033	36.3	----	24.6	8.7	33.3	23.4	27.8
Nebred	10094	36.8	----	----	11.6	35.2	18.9	27.6
Marmin	11502	33.7	36.2	22.4	13.5	31.4	20.5 1/	27.4
Minard x Minhardi	8888	36.2	37.8	20.4	9.5	32.7	21.2	27.1
Kharkof	1442	31.6	----	----	9.2	34.7	20.8	26.2
Minturki	6155	34.1	37.3	25.2	9.7	31.9	20.6	26.1

1/ Two years only.
2/ Excluding St. Paul and Grand Rapids.

States

In several of the States there were two or more cooperating stations from which data were received in 1940. At some of these stations only the uniform varieties were grown, while at others additional varieties were included. It has been the practice to summarize the data by States by averaging yields from all stations within a State. In 1940, more than one station reported data in Texas, Oklahoma, Kansas, Nebraska, and Minnesota, and summaries were made up for these.

In Texas, 13 varieties were grown at the three stations and the average yields are shown in table 9. Early Blackhull, Chiefkan, Oro x Tenmarq (C.I. 11673), and Kawvale x Tenmarq (C.I. 11669) had the highest average yields. For the period 1931-40, including 19 station-years, Quivira, Tenmarq, and Kanred have the highest averages, while for the 1938-40 period (9 station years) Chiefkan, Oro x Tenmarq (C.I. 11673), and Kawvale x Tenmarq (C.I. 11669) rank the highes

In Oklahoma, based on a 4-station average, Kawvale x Tenmarq (C.I. 11669), Blackhull, and Chiefkan had the highest average yields (table 10). For the 2-station average the same varieties are high but do not rank in the same order. For the long time average, Kharkof, Tenmarq, and Cheyenne have had the best yields. During the period 1938-40 the early varieties, Kawvale x Tenmarq (C.I. 11669), Oro x Tenmarq (C.I. 11673), and Chiefkan had the highest average yields, while Early Blackhull had the lowest.

Two stations reported yields in Kansas, and at these Kawvale x Tenmarq (C.I. 11669), Chiefkan, and Oro x Tenmarq (C.I. 11673) had the highest average, while Cheyenne, Oro, and Kharkof had the lowest (table 11). For the period 1931-40 (18 station-years) Tenmarq, Blackhull, and Cheyenne had the highest yields, while for the last three years Oro x Tenmarq (C.I. 11673), Kanred x Marquis (C.I. 11589), and Tenmarq had the best records.

In Nebraska Blackhull had the highest average yield at two stations in 1940, followed by Cheyenne selection, Kanred x Blackhull (C.I. 11844), and Turkey selection (C.I. 11577). For the 1931-40 period Cheyenne ranks first. During the last three years (1938-40), Cheyenne, Cheyenne selection, and Kawvale x Tenmarq (C.I. 11669) were at the top of the list, while for the same period Nebred has not yielded so well. The data are shown in table 12.

In Minnesota (table 13) only four varieties were grown at two stations and of these Yogo had the highest average yield. Three varieties were grown uniformly at three stations with Minturki averaging the highest. For the long time average (1937-40) Minturki has had a slight advantage in average yield.

Table 9. - Average yield in bushels per acre of winter wheat varieties grown in plot tests in Texas in 1940, and weighted averages for 1931-40 and 1938-40

Variety or cross	C.I. number	Average yield in bushels: 1940 3 stations	Rank	1931-40, 19 station-years	Rank	1938-40 9 station-years	Rank
Quivira	8886	13.2	6	24.4	1	19.6	6
Kanred	5146	12.6	9	22.4	3	18.4	8
Oro x Tenmarq	11673	14.1	3	-----	-	21.0	2
Early Blackhull	8856	14.4	1	-----	-	19.7	5
Martin x Tenmarq[3]	11805	13.0	7	-----	-	-----	-
Tenmarq	6936	12.8	8	23.9	2	19.4	7
Kawvale x Tenmarq	11669	13.9	4	-----	-	21.0	2
Blackhull	6251	13.6	5	22.2	4	19.8	4
Chiefkan	11754	14.4	1	-----	-	21.1	1
Denton	8265	9.7	13	21.3	6	17.8	10
Kharkof	1442	10.5	12	20.0	7	16.9	11
Kawvale	8180	12.3	10	22.1	5	18.2	9
Martin x Tenmarq[3]	11823	12.3	10	-----	-	-----	-

Table 10. - Average yield in bushels per acre of winter wheat varieties grown in plot tests in Oklahoma in 1940, and weighted averages for 1931-40 and 1938-40

Variety or cross	C.I. number	Average yield in bushels: 1940 2 stations	1940 4 stations	Rank	1931-40 30 station-years	Rank	1938-40 8 station-years	Rank
Kawvale x Tenmarq	11669	22.8	25.3	1	----	-	32.3	1
Chiefkan	11754	22.5	24.9	3	----	-	29.7	3
Oro x Tenmarq	11673	21.7	24.8	4	----	-	29.8	2
Blackhull	6251	20.9	25.1	2	26.1 1/	5	27.7	4
Cheyenne	8885	19.8	----	-	26.6	2	----	-
Kanred	5146	19.7	----	-	26.2	4	----	-
Sibley 62	11523	19.2	----	-	----	-	----	-
Tenmarq	6936	19.1	22.6	5	26.6	2	27.1	6
Kharkof	1442	18.9	22.6	5	26.8	1	26.8	7
Turkey	1558	18.9	----	-	25.3	7	----	-
Early Blackhull	8856	17.6	20.9	7	23.3	9	24.7	8
Kawvale	8180	17.3	18.8	8	26.1 2/	5	27.2 2/	5
Denton	8265	16.3	----	-	24.7	8	----	-

1/ Excluding Stillwater in 1935.
2/ Excluding Goodwell in 1939.

Table 11. - Average yield in bushels per acre of winter wheat varieties grown in plot tests in Knasas in 1940, and weighted averages for 1931-40 and 1938-40

Variety or cross	C.I. number	Average yield in bushels: 1940 2 stations	1931-40 10 station-years	Rank	1938-40 6 station-years	Rank
Kawvale x Tenmarq	11669	24.3	----	-	----	-
Chiefkan	11754	23.7	----	-	----	-
Oro x Tenmarq	11673	23.2	----	-	20.3	1
Oro x Tenmarq	11672	23.0	----	-	----	-
Tenmarq	6936	22.5	29.4	1	19.4	3
Kanred x Marquis	11589	22.5	----	-	19.5	2
Kawvale x Tenmarq	11750	22.1	----	-	----	-
Blackhull	6251	21.6	28.6	2	16.9	4
Nebred	10094	21.2	----	-	16.2	6
Kanred	5146	19.6	----	-	16.4	5
Turkey	1558	19.1	26.6	5	15.3	9
Cheyenne	8886	19.1	28.6	2	15.4	7
Oro	8220	18.3	26.7	4	15.0	10
Kharkof	1442	18.2	25.7	6	15.4	7

Table 12. - Average yield in bushels per acre of winter wheat varieties grown in plot tests in Nebraska in 1940, and weighted averages for 1931-40 and 1938-40

Variety or cross	C.I. number	Average yield in bushels: 1940 2 stations	1931-40 24 station-years	Rank	1938-40 8 station-years	Rank
Blackhull	6251	17.0	22.3	3	16.6	7
Cheyenne selection	11666	16.4	----	-	18.0	2
Kanred x Blackhull	11844	15.9	----	-	----	-
Turkey selection	11577	15.7	----	-	----	-
Kawvale x Tenmarq	11669	15.3	----	-	18.0	2
Cheyenne	8885	15.1	23.9	1	18.1	1
Chiefkan	11754	15.0	----	-	17.7	4
Turkey selection	10016	14.5	22.3	3	16.5	8
Oro x Tenmarq	11673	14.3	----	-	17.2	5
Tenmarq	6936	14.3	22.5	2	16.0	10
Nebred	10094	13.9	----	-	16.7	6
Kawvale x Tenmarq	11750	13.7	----	-	----	-
Kanred	5146	13.6	----	-	----	-
Oro x Tenmarq	11672	13.5	----	-	----	-
Nebraska No. 60	6250	13.1	21.9	6	16.5	8
Kharkof	1442	12.9	22.0	5	15.9	11

Table 13. - Average yield in bushels per acre of winter wheat varieties grown in plot tests in Minnesota in 1940, and weighted averages for 1937-40

Variety or cross	C.I. number	Average yield in bushels: 1940 2 stations	1940 3 stations	Rank	1937-40 11 station-years	Rank
Yogo	8033	43.5	----	-	----	-
Minturki	6155	38.2	43.8	1	32.8	1
Marmin	11502	37.5	41.0	3	31.5	3
Minard x Minhardi	8888	36.7	41.8	2	32.4	2

SUMMARY OF AGRONOMIC DATA

The agronomic data other than yield have been summarized for each district for 1940 in tables 14 to 16. In each case the data are averaged for as many varieties and as many stations as possible. The number of stations entering the average is shown at the top of each column.

The data for the southern district are presented in table 14. Average dates of heading show that the crop was later than in 1939, but that the relative order of varieties was about the same. Early Blackhull was the earliest, while Kawvale x Tenmarq (C.I. 11669) and Oro x Tenmarq (C.I. 11673) were earlier than Tenmarq. Average heights show that Chiefkan was the tallest and Kawvale x Tenmarq (C.I. 11669) the shortest variety. Stem rust readings were averaged from two stations with Early Blackhull having the lowest reading, followed by Kawvale and Blackhull. The two Blackhulls and Chiefkan had the highest average test weights per bushel, while Tenmarq and Kawvale had the lowest.

The central district data are averaged for 11 varieties and are presented in table 15. Oro x Tenmarq (C.I. 11673) and Kawvale x Tenmarq (C.I. 11669) were three days earlier on the average than Tenmarq, and four days earlier than Blackhull. Cheyenne averaged one day later

than Nebred, Kanred, and Kharkof. For ripening dates the same general order holds but the range is not as great. Nebred and Cheyenne had the shortest straw, while Chiefkan and Blackhull had the tallest. Chiefkan, Cheyenne, and Blackhull had the highest average test weights per bushel, while Kawvale x Tenmarq (C.I. 11750) had the lowest.

In the northern district six varieties may be compared for characters other than yield (table 16). For average winter survival Minard x Minhardi, and Yogo were the highest and Nebred the lowest, although the range was not great. Nebred and Marmin had the earliest average date of heading. The average heights showed Nebred to have had the shortest straw and Marmin the tallest. Average test weights were all below 60 pounds per bushel with Nebred, Marmin, and Minard x Minhardi being the heaviest and Yogo the lightest in weight.

Table 14. - Summary of agronomic data other than yield for winter wheat varieties grown at the cooperating stations in the southern district in 1940

Variety or cross	C.I. number	Average				
		Date		Height	Stem rust	Test weight per bushel
		Headed	Ripe			
		May	June	(Inches)	(Percent)	(Pounds)
Number of stations		5	3	5	2	7
Kawvale x Tenmarq	11669	16	15	26.6	20	57.4
Chiefkan	11754	17	18	29.8	22	58.5
Blackhull	6251	18	18	29.2	19	58.9
Oro x Tenmarq	11673	14	16	27.2	23	57.2
Tenmarq	6936	18	18	29.0	43	55.3
Early Blackhull	8856	8	13	27.0	9	60.0
Kharkof	1442	21	20	28.2	38	56.4
Kawvale	8180	19	18	28.2	17	55.4
Kanred	5146	20	19	27.0	33	56.5

Table 15. - Summary of agronomic data other than yield for winter wheat varieties grown at cooperating stations in the central district in 1940.

Variety or cross	C.I. number	Average			
		Date		Height	Test weight per bushel
		Headed	Ripe		
		May	June	(Inches)	(Pounds)
Number of stations		4	4	4	4
Oro x Tenmarq	11672	24	27	25.8	59.7
Oro x Tenmarq	11673	23	27	26.5	59.4
Chiefkan	11754	26	27	27.8	61.4
Kawvale x Tenmarq	11669	23	26	24.5	59.3
Tehmarq	6936	26	27	25.5	59.3
Blackhull	6251	27	28	27.3	60.6
Kawvale x Tenmarq	11750	24	26	24.8	58.0
Nebred	10094	29	28	23.0	59.9
Kanred	5146	29	29	25.8	59.7
Cheyenne	8885	30	29	24.0	61.0
Kharkof	1442	29	29	25.5	59.5

Table 16. - Summary of agronomic data other than yield for winter wheat varieties grown at cooperating stations in the northern district in 1940

Variety or cross	C.I. number	Average				
		Winter survival	Date		Height	Test weight per bushel
			Headed	Ripe		
		(Percent)	June	July	(Inches)	(Pounds)
Number of stations		2	4	4	4	4
Yogo	8033	66	17	20	32.3	56.8
Nebred	10094	60	14	18	29.5	59.2
Minard x Minhardi	8888	69	17	20	31.0	58.4
Kharkof	1442	62	16	20	31.5	57.7
Marmin	11502	63	15	20	33.3	58.5
Minturki	6155	61	16	20	32.8	57.2

SUMMARY OF PLOT DATA

The 1940 crop was subjected to few hazards other than drought but was remarkable in that it started under very poor conditions in many places, was given up as a failure, and in the end produced low to average yields. In Minnesota some very good yields were reported.

At many stations yields were extremely variable due to the lack of moisture causing soil spots to show.

Stem rust was present in Texas but failed to spread north as rapidly as expected, due in part to cool temperatures, and was serious only where the crop was very late.

In the southern district yields were reported from seven stations with Kawvale x Tenmarq (C.I. 11669), Chiefkan, and Blackhull having the highest averages.

In the central district the same three wheats ranked the highest, based on a 4-station average. The later, more hardy varieties had the lowest average yields. Lack of winter injury would probably explain these results.

In the northern district Yogo had the highest average yield at four stations, with Nebred ranking second. Marmin ranked first at Grand Rapids and Dickinson.

The high average yield of Kawvale x Tenmarq (C.I. 11669) for the second year would indicate that the variety should be considered rather carefully. Its quality is probably acceptable but not outstanding, it is early, has some leaf rust resistance, but is inclined to shatter, and it is rather winter tender. It appears to have the ability to yield well over a wide area.

Based on 1940 results selection of early, tender types will continue in the central district. A winter with severe killing might prove that this has been the wrong procedure.

UNIFORM YIELD NURSERY

In the fall of 1939 the uniform yield nursery was seeded at the same 13 stations in the central and southern districts as in 1938. In addition a nursery was seeded at Ames, Iowa, giving a total of 14 locations. At Bushland, the nursery was seeded on both dry and irrigation land. The nursery consisted of 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 17 the varieties making up the 1940 nursery, together with State and C.I. numbers, are shown.

A comparison of the 1940 list with that of 1939 will show a number of changes in the nursery. Nine 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 omitted 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. An attempt is also made to avoid too many duplications between plot and nursery tests.

DATA OBTAINED

In table 18 are presented the data from the 14 nurseries. The 30 varieties were grown in all of those nurseries except at Stillwater where one strain was discarded. For each station the varieties are listed in order of the 1939 yield. Only the C.I. numbers are given for identification. The average yields and ranks for the 4-year period (1937-40) and the 2-year period (1939-40) are given wherever possible. 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, lodging was noted in a few of the varieties and very good rust notes were obtained. The following strains showed considerable resistance to leaf rust: C.I. numbers 11956, 11969, 11953, 11750, and 11950. C.I. numbers 11969, 11975, and 11976 had low stem rust readings. Stem rust seemed to have influenced yield and quality since the more susceptible strains had the lower yields and test weights per bushel. Yields ranged from 38.6 to 19.2 bushels per acre. For the 4-year average yield, C.I. numbers 11750, 11669, and 8856 rank highest, while for the 2-year average C.I. numbers 11952, 11847, and 8856 are highest. Kharkof ranks last for both periods.

At Bushland, the nursery on dry land yielded about one-fourth as much as the one grown under irrigation. C.I. 11950 yielded highest and C.I. 8856 the lowest in each nursery, but beyond these the correlation was not too good. The 1940 yields do not agree well with the averages.

Table 17.- Varieties of winter wheat grown in the uniform yield nursery, 1940

Variety or cross	C.I. number	State number
Kharkof	1442	-----
Blackhull	6251	-----
Early Blackhull	8856	-----
Nebred	10094	Nebr. No. 1063
Sibley 62	11523	Oklahoma
Oro x Fulhard	11579	Nebr. No. 1083
Tenmarq x Minturki	11580	Nebr. No. 1094
Cheyenne selection	11666	Nebr. No. 1087
Kawvale x Tenmarq	11669	Nebr. No. 1086
Oro x Tenmarq	11673	Kans. No. 2729
Kanred x Marquis	11746	Akron No. 46
Kawvale x Tenmarq	11750	Kans. No. 2727
Martin x Tenmarq^3	11805	Denton No. 50-33-63
Martin x Tenmarq^3	11823	Denton No. 50-34-128
Kanred x Blackhull	11844	Nebr. No. 1098
Early Blackhull Hybrid	11846	Hays Cereal No. 366
Tenmarq x Nebraska No. 28	11847	Woodward No. 1094
Kawvale x Tenmarq	11950	Kans. No. 2726
Early Blackhull x Tenmarq	11952	Kans. No. 2739
Kawvale x Tenmarq	11953	Denton No. 35-34-96
Kawvale x Tenmarq	11956	Denton No. 35-34-117
Hope x Cheyenne	11969	Nebraska selection No. 363339
Kanred-Hard Federation x Minhardi-Minturki	11970	Akron No. 130
Ft. Collins selection	11971	F. C. 1143
Cheyenne x Tenmarq	11972	Kans. No. 2748
Cheyenne x Tenmarq	11973	Kans. No. 2751
Kanred-Hard Federation x Tenmarq	11974	Denton No. 37-34-54
Kanred x Hope-Hard Federation	11975	Akron No. 533
Kanred x Hope	11976	Akron No. 850
Compound Cross	11977	Akron No. 874

Early drought kept down straw growth at Chillicothe, but quality was good as indicated by test weights. Yields ranged from 12.5 bushels for C.I. 10094, to 22.5 bushels per acre for C.I. 11844. The average yields for 1939-40 show C.I. numbers 8856, 6251, and 10094 to be the highest.

A good crop was harvested at Stillwater with a range of 23.2 bushels between the highest and lowest yielding varieties. Test weights per bushel ranged from 58.2 to 63.3 pounds. The highest yielding varieties were C.I. numbers 11950, 11669, 11972, and 11750. For the 4-year period C.I. numbers 11669 and 11750 have the highest averages, while for the last two years C.I. numbers 11950, 11952, and 11953 top the list.

At Woodward, shattering notes taken several weeks after harvest were reported along with other data. Most resistant were C.I. numbers 10094, 8856, 11969, and 11977, while C.I. numbers 11846, 11746, 11847, and 11953 shattered the most. The highest yields were made by C.I. numbers 11974, 11956, and 11972, while C.I. numbers 1442 and 11977 were at the bottom of the list. C.I. numbers 11669, 11750, and 11580 have had the best 4-year average yield, while for the period 1939-40 C.I. numbers 11953, 11950, and 11971 are at the top.

The nursery at Manhattan was good with hoights ranging from 34 to 42 inches. A fairly wide range in test weight was reported with several strains going above 60 pounds per bushel. C.I. numbers 11950 and 11952 had the highest yields and were among the 15 strains that out-yielded Blackhull. No 1939 yields are available but for the 3-year average C.I. numbers 11953, 11750, and 11844 had the highest yields.

At Hays the nursery yielded slightly higher than the plots, with maturity, height, and yield data being reported. There was a tendency for the early varieties to have the highest yields although some exceptions to this can be noted. The highest yield was made by C.I. 11580, a medium early variety, and the lowest by C.I. 1442, the latest variety of the group. The 1940 yields appear to be somewhat out of line with those of previous years.

As stated before, a nursery was grown at Ames, Iowa, in 1940 for the first time. There was heavy straw growth with heights all over 40 inches. Considerable lodging was reported for all varieties except C.I. numbers 8856, 11746, and 11844. Good leaf and stem rust data were obtained with C.I. numbers 11750, 11669, and 11969 being the most resistant to both diseases. Acre yields ranged from 65.2 bushels for C.I. 11750 to 42.2 bushels for C.I. 11523.

The Lincoln nursery was grown on fallow but in spite of this the crop was only fair as indicated by test weights below 60 pounds per bushel and yields ranging from 35.4 down to 22.9 bushels per acre. Plant heights ranged from 29 to 38 inches with C.I. 8856 being the tallest variety. Lodging was reported for several of the varieties. Highest yields were from C.I. numbers 8856, 6251, and 11666, while C.I. numbers 11969 and 11805 had the lowest yields. The average yields for the period 1937-40 show C.I. numbers 11669, 11673, and 11750 to have been the highest, while for the last two years C.I. numbers 8856, 11950, and 6251 were high. These are all early, fairly tender varieties.

At North Platte, the nursery was grown on bottom land since the upland was so dry at seeding time. Plant growth was fairly good but very spotted. No lodging was reported but C.I. numbers 11953, 11956, and 11971 shattered rather easily. Test weights were nearly all above 60 pounds per bushel. The highest yields were recorded for C.I. numbers 11669, 11846, and 11750, with five strains ranking above C.I. 10094. For the 2-year average, four strains have had yields above C.I. 10094.

No winterkilling was reported from Alliance with weights per bushel and yields being rather low. A total of 9 strains yielded higher than C.I. 10094 in 1940 and two strains had 1939-40 averages above.

Fall stands were low and variable at Fort Collins, but in spite of this yields were good. Lodging notes were recorded for most strains, although eight stood up in good shape. Yields ranged from over 50 bushels for C.I. numbers 11950 and 11805 to 30.3 bushels for C.I. 11977.

ive varieties yielded above C.I. 1442 (Kharkof) and C.I. 6251 (Blackhull) was well down the list. C.I. numbers 11666 and 1442 had the best 4-year average, while for the 1939-40 average C.I. numbers 11950, 11844, and 11846 were at the top.

At Hesperus growth was good but variable, and no lodging was reported. Seven new strains yielded above C.I. 6251 (Blackhull). There seemed to be little or no relation between time of maturity and yield. For the 1939-40 average, C.I. numbers 11673, 11970, and 11844 were the highest.

STANDARD ERRORS

Standard errors were calculated for each station (except Ames) as outlined on page 24 of this report. In table 19 will be found the number of plots, average yields, and standard errors for the uniform nursery grown at each of the 12 stations.

Table 18. - 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, 1940, and average yields for 1937-40

Denton, Texas
(Four plots)

C.I.No.	Date		Height	Lodging	Rust		Weight per bushel	Average acre yield	Yield			
	Headed	Ripe			Leaf	Sten			1937-40		1939-40	
									Average	Rank	Average	Rank
			(In.)	(Pct.)	(Pct.)	(Pct.)	(Lbs.)	(Bu.)	(Bu.)		(Bu.)	
11956	May 2	June 4	33	0	5	15	60.0	38.6	----	-	----	-
11847	May 1	June 5	38	0	44	25	60.0	38.2	----	-	33.4	2
11952	April 22	May 31	34	0	87	17	61.0	36.5	----	-	34.3	1
8856	April 22	May 30	33	0	80	9	61.5	35.9	32.9	3	33.2	3
11669	May 1	June 2	33	0	10	18	59.5	34.0	33.3	2	32.4	4
11969	May 4	June 6	33	0	3	1	58.0	33.0	----	-	----	-
11974	April 29	June 3	35	0	38	52	57.0	32.8	----	-	----	-
11972	May 1	June 4	35	0	28	48	58.0	32.7	----	-	----	-
11673	April 28	June 4	35	0	22	35	58.0	32.3	32.9	3	29.9	7
11666	May 5	June 5	31	0	87	18	58.5	31.9	21.0	10	23.9	16
11580	May 2	June 6	37	0	55	57	58.0	31.9	30.4	5	29.3	10
11975	April 24	June 4	33	0	42	7	60.5	31.6	----	-	----	-
11976	April 30	June 4	34	0	78	5	59.0	31.3	----	-	----	-
6251	May 3	June 6	37	8	62	20	61.0	31.0	23.9	6	28.9	11
11953	May 5	June 5	35	0	9	28	56.0	30.9	----	-	29.9	7
11750	April 30	June 3	33	0	5	13	57.0	29.9	34.0	1	31.7	5
10094	May 5	June 6	33	0	80	13	58.5	29.6	21.5	9	23.7	18
11970	April 29	June 3	38	0	58	68	58.0	29.4	----	-	26.6	13
11971	April 30	June 4	35	0	78	10	60.0	29.0	----	-	23.6	19
11805	May 4	June 5	36	0	28	52	56.0	28.6	----	-	30.0	6
11823	May 4	June 5	35	0	30	47	54.0	27.5	----	-	----	-
11973	April 28	June 3	33	0	32	78	59.5	27.3	----	-	----	-
11844	April 30	June 5	38	8	45	53	58.5	27.0	----	-	26.9	12
11846	May 1	June 5	38	0	48	55	56.5	26.7	----	-	26.3	14
11950	May 1	June 4	36	0	5	67	57.5	26.4	----	-	29.9	7
11523	May 5	June 5	36	10	43	60	55.0	25.7	22.5	8	23.9	16
11579	May 3	June 5	37	8	48	45	57.0	25.4	20.8	11	22.6	20
11746	May 4	June 5	36	5	38	65	58.0	24.8	23.0	7	25.1	15
11977	May 1	June 4	33	0	82	47	56.0	22.3	----	-	----	-
1442	May 5	June 6	34	0	70	52	54.0	19.2	17.1	12	19.3	21

Standard error of a difference between the mean yields of any two varieties = 3.21 bushels.

Bushland, Texas
(Four plots)
(Dryland)

C.I.No.	Date Headed	Date Ripe	Height	Plumpness	Weight per bushel	Average acre yield	Yield 1937-40 Average	Yield 1937-40 Rank	Yield 1939-40 Average	Yield 1939-40 Rank
		July	(In.)	(Percent)	(Lbs.)	(Bushels)	(Bushels)		(Bushels)	
11950	May 31	2	26	81	57.0	6.6	----	-	13.0	4
11823	June 1	3	27	80	55.0	6.6	----	-	----	-
6251	June 1	5	27	84	58.5	6.4	14.7	2	12.2	6
11956	June 2	3	25	81	56.0	6.2	----	-	----	-
11977	May 30	2	24	84	58.0	6.2	----	-	----	-
11579	June 4	7	26	87	59.0	5.9	14.5	3	10.3	19
11973	May 31	2	22	87	59.0	5.9	----	-	----	-
11805	June 1	4	25	80	56.0	5.6	----	-	11.7	8
11970	June 1	4	28	84	58.0	5.6	----	-	12.4	5
11846	June 2	4	26	80	56.5	5.5	----	-	11.1	15
10094	June 3	6	24	84	58.5	5.5	12.5	9	11.6	9
11976	May 30	2	24	82	56.0	5.5	----	-	----	-
11969	May 31	3	23	85	56.0	5.3	----	-	----	-
11972	June 2	2	23	85	58.0	5.3	----	-	----	-
11847	June 2	4	25	80	58.0	5.2	----	-	12.0	7
11523	June 4	5	23	80	56.5	5.1	13.9	4	11.0	17
11666	June 3	6	23	82	57.0	5.1	12.9	7	11.5	10
11974	May 31	2	25	78	55.5	5.1	----	-	----	-
1442	June 5	7	24	80	56.0	5.0	11.8	11	9.6	20
11844	June 2	5	24	82	57.5	5.0	----	-	11.5	10
11953	June 2	2	24	76	55.0	5.0	----	-	10.8	18
11971	June 3	5	25	76	55.5	5.0	----	-	11.5	10
11673	June 1	2	24	79	56.5	4.8	13.6	5	11.4	13
11750	May 30	1	23	77	56.5	4.8	12.8	8	11.1	15
11580	June 3	6	25	78	57.5	4.8	13.6	5	11.3	14
11669	May 29	2	24	82	58.5	4.7	14.8	1	13.1	3
11746	June 3	6	24	76	57.0	4.6	11.5	12	8.9	21
11975	May 31	3	24	79	57.0	4.6	----	-	----	-
11952	May 28	1	27	86	61.0	4.5	----	-	13.3	1
8856	May 27	1	25	85	59.5	3.9	12.3	10	13.2	2

Standard error of a difference between the mean yields of any two varieties = 0.83 bushels.

Bushland, Texas
(Four plots)
(Irrigated)

C.I.No.	Date		Height	Plumpness	Weight per bushel	Average acre yield
	Headed	Ripe	(Inches)	(Percent)	(Pounds)	(Bushels)
11950	May 23	June 27	30	85	60.0	24.3
11973	May 24	June 30	28	89	60.0	24.0
11844	May 27	June 29	32	86	60.0	23.8
11669	May 20	June 28	25	84	59.0	23.5
11580	May 27	July 1	29	85	59.0	22.6
11805	May 24	June 29	29	85	58.5	22.5
11969	May 25	June 28	29	87	59.0	22.3
11953	May 30	July 1	29	82	57.0	21.9
11971	May 29	July 2	29	80	58.0	21.5
11974	May 22	June 29	28	83	59.5	21.3
10084	May 30	July 2	28	87	60.5	21.2
11956	May 29	June 29	28	85	60.0	21.1
11975	May 19	June 28	26	88	60.0	21.0
11750	May 23	June 29	27	83	60.0	20.5
11972	May 29	July 1	28	88	59.0	20.5
11846	May 28	June 30	30	86	58.0	19.8
1579	May 28	July 2	29	87	61.0	19.8
1976	May 22	June 29	28	82	57.0	19.1
1523	May 31	July 1	30	85	59.0	18.9
1823	May 27	June 30	27	84	57.0	18.5
1442	June 1	July 3	31	85	59.0	17.9
11847	May 28	June 30	29	84	60.0	17.0
11666	May 30	July 1	26	86	60.0	16.8
11746	May 27	July 2	30	83	60.0	16.7
11977	May 24	July 1	28	82	58.0	16.5
11952	May 21	June 29	26	88	62.0	16.4
6251	May 29	July 3	29	85	61.0	16.3
11970	May 28	July 2	30	84	58.5	15.3
11673	May 28	June 30	27	85	59.5	14.7
8856	May 18	June 28	26	88	----	14.2[1]

1/ Average of only 3 plots.

Standard error of a difference between the mean yields of any two varieties = 2.94 bushels.

Chillicothe, Texas
(Four plots)

C.I. No.	Date headed	Height	Weight per bushel	Average acre yield	Yield	
					Average 1939-40	Rank
	May	(Inches)	(Pounds)	(Bushels)	(Bushels)	
11844	11	22	63	22.5	24.4	5
11805	11	28	61	21.6	24.6	4
8856	3	25	63	21.4	25.6	1
11823	11	28	61	21.3	----	-
11973	9	26	62	21.1	----	-
11673	4	25	61	20.9	24.3	6
11579	11	24	62	20.9	23.5	10
11847	9	27	63	20.4	24.1	7
11666	11	22	63	20.4	22.8	13
11970	9	28	62	20.0	22.9	12
11972	11	26	62	19.8	----	-
11952	3	26	64	19.5	20.3	17
6251	9	25	63	19.3	24.9	2
11971	11	28	61	19.3	20.1	18
11523	11	26	62	18.8	23.8	8
11953	11	25	60	18.6	23.6	9
11974	5	26	59	18.4	----	--
11669	9	24	62	18.4	23.2	11
11750	9	24	59	17.7	22.2	14
11746	9	24	62	17.5	21.9	15
11580	9	28	61	17.5	20.6	16
11976	9	27	60	17.0	----	-
11846	9	26	62	16.8	17.6	20
11956	11	26	61	16.3	----	-
11969	11	26	60	16.3	----	-
11975	5	27	59	16.1	----	-
11977	9	25	60	15.2	----	-
11950	9	26	60	15.0	17.6	20
1442	11	25	59	13.2	18.1	19
10094	11	25	63	12.5	24.7	3

Standard error of a difference between the mean yields of any two varieties = 3.45 bushels.

Stillwater, Oklahoma
(Four plots)

C.I. No.	Date ripe	Height	Weight per bushel	Average acre yield	Yield 1937-40		Yield 1939-40	
					Average	Rank	Average	Rank
	June	(Inches)	(Pounds)	(Bushels)	(Bushels)		(Bushels)	
11950	11	32	60.0	41.2	----	-	39.1	1
11669	10	30	62.0	39.7	33.9	1	34.1	5
11972	11	31	60.3	39.3	----	-	----	-
11750	12	31	59.3	38.3	32.8	2	34.3	4
11956	11	31	61.6	37.7	----	-	----	-
11974	10	29	59.5	36.9	----	-	----	-
11953	11	33	58.7	36.8	----	-	34.5	3
11969	12	31	59.0	36.4	----	-	----	-
11844	14	32	59.5	35.8	----	-	30.9	9
11975	13	31	60.9	35.6	----	-	----	-
11952	10	29	63.3	35.3	----	-	36.8	2
11973	11	30	----	34.3	----	-	----	-
11976	11	31	59.5	33.9	----	-	----	-
11847	14	32	60.4	33.1	----	-	31.5	8
1523	13	31	59.4	32.6	26.8	9	28.7	11
1580	14	31	59.3	32.6	29.3	6	28.0	15
6251	13	33	62.2	32.1	29.9	5	32.0	7
1823	11	31	58.2	32.1	----	-	----	-
11579	13	30	60.0	30.5	27.4	8	28.4	12
11846	14	32	59.5	30.2	----	-	28.3	14
8856	10	30	63.0	29.3	30.6	3	32.6	6
10094	13	28	60.0	29.3	25.9	11	28.0	16
1442	14	32	59.2	29.2	26.5	10	27.8	17
11746	15	33	59.7	28.9	27.6	7	28.8	10
11971	13	30	60.0	26.3	----	-	27.3	19
11805	13	31	58.4	26.0	----	-	25.9	20
11673	12	29	62.2	23.9	30.3	4	28.4	12
11970	11	34	----	22.0	----	-	27.7	18
11977	14	30	58.2	18.0	----	-	----	-

Standard error of a difference between the mean yields of any two varieties = 2.91 bushels.

Woodward, Oklahoma
(Four plots; seeded October 17, 1939; emerged November 21, 1939)

C.I. No.	Date Headed	Date Ripe	Height	Shattering 1/	Weight per bushel	Average acre yield	Yield 1937-40 Av.	Yield 1937-40 Rank	Yield 1939-40 Av.	Yield 1939-40 Rank
	May	June	(Inches)	(Percent)	(Pounds)	(Bushels)	(Bu.)		(Bu.)	
11974	17	19	27	17	59	30.7	-----	-	-----	-
11956	21	20	28	45	60	30.1	-----	-	-----	-
11972	20	21	27	23	59	30.1	-----	-	-----	-
11953	21	19	27	47	58	29.4	-----	-	31.9	1
11950	18	19	27	10	59	29.2	-----	-	31.9	1
11971	23	22	28	43	58	28.8	-----	-	30.9	3
11975	17	22	27	13	59	28.5	-----	-	-----	-
11973	18	19	26	7	61	28.0	-----	-	-----	-
11666	22	19	27	7	59	27.8	26.3	5	27.9	12
11823	21	23	29	17	56	27.7	-----	-	-----	-
11844	18	23	28	45	59	27.4	-----	-	27.3	14
11805	20	21	29	13	58	27.2	-----	-	27.0	19
11523	22	24	29	43	59	27.2	26.2	6	30.3	5
11970	19	20	30	20	59	27.1	-----	-	30.5	4
11750	17	18	25	20	59	27.0	30.4	2	28.9	8
11669	16	18	25	10	60	26.7	31.7	1	28.6	9
11580	19	21	27	10	59	26.5	29.7	3	28.1	10
11952	13	18	23	12	61	26.4	-----	-	30.2	6
10094	23	23	28	T	59	26.3	25.7	7	29.0	7
11673	17	20	27	7	60	26.0	26.5	4	28.1	10
11976	20	22	28	22	57	26.0	-----	-	-----	-
11847	21	23	30	52	60	25.9	-----	-	27.3	14
11579	21	22	26	40	60	25.1	25.6	8	27.5	13
6251	24	25	32	10	60	24.8	23.2	10	27.3	14
11746	21	24	28	52	59	24.1	23.2	10	24.2	21
8856	13	19	26	T	61	23.1	24.3	9	27.3	14
11846	21	23	30	55	59	22.7	-----	-	26.0	20
11969	21	20	26	T	58	22.7	-----	-	-----	-
1442	26	26	29	5	60	21.5	22.3	12	27.2	18
11977	22	24	27	T	58	20.5	-----	-	-----	-

1/ Shattering notes taken July 8.

Standard error of a difference between the mean yields of any two varieties = 2.29 bushels.

Manhattan, Kansas
(Three plots)

C.I. No.	Date		Height	Weight per bushel	Average acre yield	Yield 1937, 1938, and 1940	
	Headed	Ripe				Average	Rank
	May	June	(Inches)	(Pounds)	(Bushels)	(Bushels)	
11950	17	23	38	58.5	42.5	-----	-
11952	16	19	36	60.9	41.0	-----	-
11973	18	24	38	61.3	40.5	-----	-
11669	22	25	41	58.5	40.3	36.1	1
11953	23	25	37	58.2	38.5	-----	-
11579	22	26	39	59.2	37.4	28.8	11
11972	21	26	38	60.1	37.0	-----	-
1442	23	27	41	57.8	36.8	28.6	12
11673	19	24	38	59.3	36.7	35.3	3
11844	20	26	40	58.9	36.7	-----	-
11750	20	22	36	57.8	36.7	36.0	2
11846	20	25	40	60.1	36.6	-----	-
11956	22	25	39	59.1	36.6	-----	-
11971	20	23	36	58.6	35.9	-----	-
11523	22	26	41	58.4	35.2	29.3	8
5251	21	26	42	59.8	34.9	29.1	9
1580	20	23	37	58.4	33.8	33.1	4
1666	24	26	38	58.9	33.3	31.1	5
1974	17	21	33	57.1	33.2	-----	-
11746	21	26	41	58.6	32.7	29.0	10
10094	24	26	39	58.8	32.6	30.5	6
11847	19	23	37	61.9	32.5	-----	-
11823	21	23	38	56.1	31.9	-----	-
8856	13	19	36	60.6	31.3	29.4	7
11805	21	23	37	56.2	29.0	-----	-
11976	19	22	34	57.2	29.0	-----	-
11970	19	22	38	57.7	28.1	-----	-
11969	21	23	35	57.5	27.8	-----	-
11975	15	22	34	58.3	26.8	-----	-
11977	22	25	36	56.5	23.7	-----	-

Standard error of a difference between the mean yields of any two varieties = 4.34 bushels.

Hays, Kansas
(Three plots)

C.I.No.	Date		Height	Average acre yield	Yield			
					1937-40		1939-40	
	Headed	Ripe	(Inches)	(Bushels)	Average (Bushels)	Rank	Average (Bushels)	Rank
11580	May 29	July 1	24	20.2	21.8	4	17.3	8
11844	May 27	June 29	25	18.8	-----	-	17.4	7
11956	May 30	June 28	24	18.6	-----	-	-----	-
11952	May 23	June 27	25	18.5	-----	-	18.1	2
11974	May 27	June 28	24	18.3	-----	-	-----	-
11673	May 27	June 28	24	18.0	22.5	3	17.9	3
11846	May 29	June 28	25	18.0	-----	-	17.8	4
11950	May 27	June 28	25	17.9	-----	-	18.5	1
11847	June 1	June 28	27	17.7	-----	-	17.6	6
11972	May 30	June 28	22	17.7	-----	-	-----	-
11973	May 26	June 28	23	17.4	-----	-	-----	-
8856	May 20	June 25	24	17.2	18.1	12	17.8	4
11666	May 29	June 28	23	17.0	20.0	8	15.0	13
6251	May 29	June 29	25	16.9	21.2	5	15.4	12
11669	May 28	June 28	22	16.8	23.3	2	16.2	9
11805	May 30	June 30	26	16.7	-----	-	15.0	13
11969	May 30	July 1	23	16.5	-----	-	-----	-
11823	May 30	June 30	24	16.4	-----	-	-----	-
11976	May 27	July 1	24	16.1	-----	-	-----	-
10094	June 1	June 30	24	16.0	19.5	9	14.6	16
11975	May 25	June 28	23	15.9	-----	-	-----	-
11977	May 27	June 30	23	15.6	-----	-	-----	-
11971	May 30	June 30	24	15.5	-----	-	15.9	10
11953	June 1	June 30	22	15.2	-----	-	14.7	15
11979	June 1	June 30	23	15.2	18.6	10	14.5	17
11970	May 30	July 1	25	14.9	-----	-	15.6	11
11523	June 1	June 30	25	14.8	20.2	7	12.4	20
11750	May 30	June 29	23	14.8	24.5	1	14.0	18
11746	June 1	June 29	25	14.5	20.8	6	13.4	19
1442	June 3	June 30	24	11.3	18.5	11	10.1	21

Standard error of a difference between the mean yields of any two varieties = 2.11 bushels.

Ames, Iowa
(Four plots)

C.I. No.	Date ripe	Height	Lodging	Rust		Weight per bushel	Average acre yield
				Leaf	Stem		
	July	(Inches)	(Percent)	(Coef.)	(Coef.)	(Pounds)	(Bushels)
11750	6	45	10	4	1	57.9	65.2
11580	8	43	90	21	4	58.7	64.8
11971	8	47	50	85	25	58.7	62.7
11669	6	44	10	4	1	60.0	62.1
11847	6	45	20	25	8	60.7	61.0
11952	2	45	100	55	2	60.4	60.9
11953	6	44	50	14	14	55.5	59.4
11846	6	44	90	12	14	56.8	59.2
11974	8	46	70	14	11	54.9	57.8
11823	8	44	90	20	12	54.0	55.9
11973	7	42	100	25	41	57.6	55.2
11666	7	42	40	18	3	59.3	54.5
11970	6	47	20	48	32	57.1	53.9
6251	8	48	50	35	2	61.0	53.7
8856	1	44	0	40	0	60.7	53.6
11950	8	42	100	8	21	56.3	53.3
11805	8	44	80	50	7	55.1	53.2
11673	3	48	60	2	8	59.1	53.0
11956	8	40	90	12	8	58.0	52.7
11975	7	43	20	35	T	58.7	52.6
11972	8	41	90	21	23	56.4	52.3
10094	7	46	15	35	2	59.1	51.8
11976	7	44	10	65	1	57.8	51.0
11746	6	44	0	14	5	58.4	49.7
11844	6	42	0	21	11	54.8	49.1
1442	8	45	50	60	2	56.0	48.4
11977	8	44	10	50	9	54.7	48.3
11969	8	40	70	4	0	57.3	48.3
11579	8	44	70	55	8	57.4	45.4
11523	6	41	90	16	4	55.3	42.2

av. 54.4

Lincoln, Nebraska
(Five plots; seeded September 26; emerged October 5, 1939)

C.I. No.	Date Headed	Date Ripe	Height	Lodging	Plumpness	Weight per bushel	Average acre yield	Yield 1937-40 Average	Yield 1937-40 Rank	Yield 1939-40 Average	Yield 1939-40 Rank
	May	June	(In.)	(Percent)	(Percent)	(Pounds)	(Bushels)	(Bushels)		(Bushels)	
8856	22	26	38	8	94	62.0	35.4	23.7	4	33.8	1
6251	29	28	36	5	88	60.4	35.3	22.9	6	32.2	3
11666	30	28	30	10	88	59.4	32.9	23.3	5	30.5	7
11847	28	27	35	0	90	61.3	32.0	----	-	31.0	5
11975	25	27	32	0	85	58.1	31.8	----	-	----	-
11673	26	26	35	0	86	59.1	31.5	24.4	2	30.8	6
11950	27	26	32	0	85	57.7	31.5	----	-	33.3	2
11976	28	27	33	0	88	57.2	31.5	----	-	----	-
11846	27	27	34	0	88	58.0	31.4	----	-	29.3	14
10094	29	28	31	18	90	59.2	30.9	22.6	7	30.3	8
1442	30	29	33	3	88	59.9	30.3	20.3	10	27.9	17
11971	30	27	32	0	85	58.0	30.0	----	-	30.1	10
11952	24	25	33	0	96	61.6	29.9	----	-	32.0	4
11844	28	28	32	14	88	59.8	29.4	----	-	29.7	12
11977	29	28	32	0	88	58.4	29.3	----	-	----	-
11523	30	28	34	17	90	59.6	29.2	21.7	8	29.6	13
11972	29	27	31	0	90	59.1	29.1	----	-	----	-
11974	27	26	32	0	85	56.5	29.1	----	-	----	-
11973	27	27	32	0	93	61.3	28.6	----	-	----	-
11579	29	28	31	0	90	59.9	28.5	19.9	11	27.4	19
11669	25	26	31	0	86	58.1	28.5	25.2	1	30.1	10
11953	30	26	30	0	85	56.3	28.4	----	-	29.2	15
11956	30	27	30	0	85	58.2	27.9	----	-	----	-
11970	27	27	34	0	88	58.5	27.8	----	-	30.3	8
11580	29	27	31	0	85	57.0	27.2	21.3	9	27.9	17
11750	27	26	31	0	83	55.4	26.9	23.9	3	28.3	16
11823	30	27	32	0	75	54.2	25.7	----	-	----	-
11746	28	28	30	2	88	58.2	24.3	19.1	12	25.1	21
11969	30	27	29	0	85	56.5	24.1	----	-	----	-
11805	28	26	32	0	80	54.6	22.9	----	-	27.2	20

Standard error of a difference between the mean yields of any two varieties = 4.40 bushels.

North Platte, Nebraska
(Three plots)

C.I. No.	Date		Height	Shattering	Plumpness	Weight per bushel	Average acre yield	Yield	
	Headed	Ripe						Average 1939-40	Rank
			(In.)	(Percent)	(Percent)	(Pounds)	(Bushels)	(Bushels)	
11669	May 29	June 30	30	3	88	61.3	46.9	38.7	1
11846	May 31	July 4	32	T	93	62.5	45.9	35.3	3
11750	May 31	June 30	30	3	88	60.5	44.3	35.8	2
11972	June 2	July 4	27	T	93	62.4	43.1	-----	-
11844	June 1	July 4	31	2	88	61.4	41.3	32.3	8
10094	June 2	July 5	28	T	90	62.3	41.1	33.5	5
11673	May 30	June 30	28	T	93	61.8	40.7	34.8	4
6251	May 31	July 5	31	T	90	62.2	40.3	31.0	12
11523	June 4	July 5	31	3	90	61.6	39.9	32.3	8
11823	June 2	July 4	29	T	85	58.8	39.5	-----	-
11974	June 1	June 30	29	0	90	60.9	39.1	-----	-
8856	May 24	June 29	33	T	90	62.6	39.1	32.9	6
11976	June 2	July 3	28	0	88	60.0	37.9	-----	-
11975	June 1	July 2	30	0	93	61.5	37.9	-----	-
11956	June 3	July 2	28	20	88	61.5	36.8	-----	-
11847	June 2	July 3	32	T	93	62.3	36.8	30.9	13
1579	June 2	July 2	29	5	90	61.5	36.4	29.8	16
1746	June 1	July 4	31	T	90	60.9	36.3	28.9	17
1366	June 3	July 5	27	0	90	62.2	36.0	30.8	14
1580	June 2	July 3	28	T	90	61.2	35.8	31.4	11
11950	May 30	July 1	30	3	88	61.4	35.7	32.5	7
11977	June 3	July 5	28	0	85	60.4	33.3	-----	-
11805	June 2	July 2	28	0	90	59.6	32.9	28.3	19
11952	May 28	June 28	27	0	93	63.0	32.7	32.3	8
1442	June 6	July 7	30	T	93	60.9	32.5	28.1	20
11973	June 1	July 3	29	0	90	61.9	31.6	-----	-
11971	June 2	June 30	28	10	90	61.8	31.1	30.2	15
11970	May 30	July 3	30	T	88	61.7	30.9	27.7	21
11953	June 3	July 2	25	55	88	60.0	29.8	28.4	18
11969	June 2	July 2	27	0	90	61.0	29.1	-----	-

Standard error of a difference between the mean yields of any two varieties = 4.26 bushels.

Alliance, Nebraska
(Three plots; seeded September 11, 1939)

C.I. No.	Date headed	Height	Plumpness	Weight per bushel	Average acre yield	Yield	
						Average 1939-40	Rank
	June	(Inches)	(Percent)	(Pounds)	(Bushels)	(Bushels)	
11974	4	28	80	50.0	12.4	-----	-
11750	6	27	75	51.0	11.3	22.4	1
11973	3	28	85	58.0	11.3	-----	-
11972	5	26	85	54.0	11.1	-----	-
11952	1	25	85	58.0	10.5	22.3	2
11956	7	28	80	53.0	10.5	-----	-
1442	8	26	80	54.0	10.0	18.1	15
11823	7	29	70	48.5	9.8	-----	-
11523	5	24	85	55.5	9.2	18.2	14
10094	8	24	80	54.0	9.1	20.8	3
6251	7	28	85	55.0	9.1	18.0	16
11950	3	27	65	51.5	9.0	20.3	4
11953	5	26	70	52.0	9.0	17.2	19
11975	8	28	75	51.0	9.0	-----	-
11844	4	24	80	54.0	8.8	17.4	18
11579	5	25	85	54.0	8.6	17.7	17
11970	4	30	80	54.0	8.6	18.7	12
11580	4	27	75	53.0	8.5	20.1	6
11977	6	26	75	53.5	8.5	-----	-
8856	2	24	80	55.5	8.4	18.6	13
11666	8	27	83	53.0	8.3	19.6	9
11669	5	26	75	53.0	8.3	19.7	8
11805	5	28	75	49.0	8.1	18.8	11
11746	4	24	75	52.0	8.0	16.3	21
11673	3	27	80	54.0	7.8	20.3	4
11846	3	25	85	53.0	7.8	19.0	10
11971	6	27	83	53.0	7.6	20.1	6
11847	5	25	85	55.5	7.5	17.2	19
11969	5	27	70	49.0	6.4	-----	-
11976	8	28	75	47.5	6.2	-----	-

Standard error of a difference between the mean yields of any two varieties = 1.32 bushels.

Fort Collins, Colorado
(Five plots; seeded September 16, 1939)

C.I.No.	Fall stand	Date		Height	Lodging	Average acre yield	Yield			
		Headed	Ripe				1937-40		1939-40	
	(Percent)		July	(Inches)	(Percent)	(Bushels)	Average (Bushels)	Rank	Average (Bushels)	Rank
11950	37	May 29	18	38	3	52.8	-----	-	58.6	1
11805	34	June 2	19	40	13	51.2	-----	-	54.3	4
11972	35	June 1	18	38	16	48.6	-----	-	-----	-
11846	29	June 1	18	38	3	48.2	-----	-	55.2	3
11844	41	June 1	18	39	19	47.1	-----	-	56.8	2
1442	56	June 2	19	39	32	46.3	54.3	2	52.8	6
11847	30	June 1	19	39	1	46.3	-----	-	46.9	17
11953	42	June 1	17	38	0	46.1	-----	-	47.7	14
11750	39	June 1	17	38	0	45.4	52.2	5	50.3	8
11956	39	June 3	19	39	7	45.1	-----	-	-----	-
11580	32	May 31	18	39	8	45.0	53.2	4	49.9	10
11673	28	May 29	17	38	3	44.9	51.7	8	49.1	13
11971	40	June 1	18	39	0	44.9	-----	-	54.0	5
11823	27	June 1	18	38	1	44.6	-----	-	-----	-
11974	43	May 31	18	37	0	44.1	-----	-	-----	-
11746	55	June 1	19	39	3	44.0	52.2	5	47.6	15
0094	31	June 1	18	39	9	43.4	51.8	7	47.2	16
1969	37	June 3	19	38	11	43.3	-----	-	-----	-
1666	22	June 2	19	37	7	42.1	54.9	1	50.0	9
6251	52	May 30	18	40	11	41.4	50.9	10	44.8	19
11952	38	May 27	16	38	1	41.3	-----	-	51.0	7
11975	24	May 31	19	37	0	41.1	-----	-	-----	-
11970	31	May 31	19	41	8	39.7	-----	-	49.9	10
11869	23	May 30	18	37	0	39.6	54.1	3	49.4	12
11523	20	June 1	19	39	36	39.2	51.1	9	46.5	18
11973	15	June 1	19	38	0	38.5	-----	-	-----	-
11579	23	June 1	19	38	9	38.2	49.6	11	42.8	21
11976	42	May 30	18	37	1	36.0	-----	-	-----	-
8856	22	May 28	16	40	18	36.0	48.0	12	43.6	20
11977	31	June 1	18	37	0	30.3	-----	-	-----	-

Standard error of a difference between the mean yields of any two varieties = 3.90 bushels.

Hesperus, Colorado
(Three plots; seeded Sept. 20; emerged Sept. 28, 1939)

C.I. No.	Date ripe July	Height (Inches)	Average acre yield (Bushels)	Yield	
				Average 1939-40 (Bushels)	Rank
11972	15	39	49.7	-----	-
11673	16	39	48.8	54.7	1
11970	17	39	44.7	47.8	2
11976	13	40	42.7	-----	-
11846	17	41	42.4	41.0	9
11974	13	37	41.1	-----	-
11977	15	39	39.0	-----	-
8856	12	37	38.8	33.0	19
11523	15	39	38.3	41.2	8
6251	14	39	37.0	40.9	10
11746	17	40	36.7	40.6	12
11844	15	39	36.4	44.8	3
11950	14	38	36.3	44.4	4
11847	18	44	35.9	40.9	10
11669	14	37	34.8	41.5	7
1442	17	39	34.7	37.2	14
11666	15	37	34.7	42.2	6
11956	14	37	34.7	-----	-
11823	15	38	34.4	-----	-
11975	16	41	34.0	-----	-
10094	14	36	32.5	32.0	21
11750	14	37	31.7	34.6	18
11973	14	38	31.6	-----	-
11580	15	38	27.5	36.9	15
11579	16	37	27.4	40.4	13
11971	17	37	27.3	42.3	5
11969	16	37	26.8	-----	-
11952	14	37	24.3	36.2	16
11953	16	36	23.7	35.2	17
11805	16	37	22.9	32.1	20

Standard error of a difference between the mean yields of any two varieties = 9.53 bushels.

Table 19. - 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 1940

Station	Number of plots	Average yield of varieties	Standard error of a			
			Difference between means	Single plot	Mean in	
					Bushels	Percent
		(Bushels)	(Bushels)	(Bushels)		
Texas:						
Denton	4	30.03	3.21	4.54	2.27	7.56
Chillicothe	4	18.45	3.45	4.88	2.44	13.22
Bushland (Irrigated)	4	19.65	2.94	4.16	2.08	10.59
Bushland (Dryland)	4	5.31	0.83	1.18	0.59	11.11
Oklahoma:						
Woodward	4	26.47	2.29	3.24	1.62	6.12
Stillwater	4	32.31	2.91	4.12	2.06	6.38
Kansas:						
Manhattan	3	34.30	4.34	5.32	3.07	8.95
Hays	3	16.61	2.11	2.58	1.49	8.97
Colorado:						
Fort Collins	5	43.16	3.90	6.17	2.76	6.39
Hesperus	3	35.03	9.53	11.67	6.74	19.24
Nebraska:						
Lincoln	5	29.38	4.40	6.95	3.11	10.59
North Platte	3	37.12	4.26	5.21	3.01	8.11
Alliance	3	8.96	1.32	1.61	0.93	10.38

SUMMARY OF NURSERY YIELDS

The yields of the 30 varieties of winter wheat grown at 13 stations (14 nurseries) are summarized in table 20, where the varieties are listed in order of the 13-station average yield. These averages are of interest only insofar as they show the general adaptation of the variety. A more detailed study is possible, as the varieties also have been averaged and ranked by States.

Cheyenne x Tenmarq (C.I. 11972), in the nursery for the first time, had the highest average yield in 1940. The performance of this variety was none too consistent since it ranked first in Colorado and twenty-first at Ames, Iowa. Kawvale x Tenmarq (C.I. 11669) ranked second and was fairly high in all States except Colorado. This strain ranked high in the 1939 nursery and made a very high average yield in the 1940 plot tests. In third place was Kawvale x Tenmarq (C.I. 11950), a strain that ranked first in the 1939 nursery. This selection has shown an inclination to shatter under certain conditions. Kanred-Hard Federation x Tenmarq (C.I. 11974) ranked fourth, averaging just 0.1 bushel below the third place variety. Two other Kawvale x Tenmarq strains, C.I. numbers 11750 and 11956, ranked fifth and sixth, while Early Blackhull ranked sixth. Early Blackhull-Hybrid ranked first in Nebraska and third in Colorado but was much lower in the southern States. Ten selections had average yields above Blackhull and for eight of these Tenmarq was one of the parents. Early Blackhull ranked seventeenth, Nebred twenty-first, and Kharkof next to last. Hope x Cheyenne (C.I. 11969), a rust-resistant strain, failed to give a good average yield but made its best record in Texas where it ranked ninth. Compound Cross (C.I. 11977) was uniformly poor at all stations, and averaged less than Kharkof.

Twenty-one varieties have been grown in the nursery for the 2-year period 1939 and 1940, at 11 stations. These data are presented in table 21, where the yields are averaged by States, and the varieties are listed in order of yield at all stations. Kawvale x Tenmarq (C.I. 11950) had the highest average yield and was consistently high at all places except in Texas. Oro x Tenmarq (C.I. 11669) and Early Blackhull x Tenmarq (C.I. 11952) were tied for third place. Kanred x Blackhull (C.I. 11844), and Kawvale x Tenmarq (C.I. 11750) ranked fifth and sixth, respectively, while Early Blackhull was in seventh place. Later varieties such as Cheyenne selection, Nebred, and Kharkof had averages considerably lower than the strains mentioned above. These data again emphasize the fact that earliness has been a most important characteristic of a wheat variety for the last two years.

SUMMARY OF AGRONOMIC DATA

Data for characters other than yield are averaged and presented in table 22. Since all stations did not report the same data, the number of stations entering the averages is shown at the top of each column.

Date-of-heading data show that Early Blackhull was the earliest variety, averaging four days earlier than Kanred x Hope-Hard Federation. Several other varieties had average dates six days earlier than Kharkof. Kharkof was the latest variety in the group, averaging 11 days later than Early Blackhull. Ripening dates bring out the same differences although the spread was not as great.

Height measurements were reported from all nurseries, but the averages show no great differences.

Lodging data were taken at four stations with a number of varieties having very low averages. Sibley 62 lodged the worst.

Leaf and stem rust readings from two stations show that the following varieties had low average infections for both diseases: Hope x Cheyenne, Kawvale x Tenmarq (C.I. numbers 11750, 11669, and 11956). Some other strains had low readings for one rust but not the other.

Shattering notes from two stations showed wide differences with a few strains having averages of zero. Some Kawvale hybrids shattered considerably while others were much better.

Kernel plumpness and test weight were reported for some stations. In both cases Early Blackhull x Tenmarq (C.I. 11952) had the highest averages. Other strains having high plumpness averages were Cheyenne x Tenmarq (C.I. numbers 11973 and 11972) and Oro x Fulhard (C.I. 11579), while Martin x Tenmarq^3 (C.I. 11823) had the lowest average. Varieties having average test weights of 60 pounds or more per bushel were Early Blackhull, Blackhull, Tenmarq x Nebraska No. 28, and Cheyenne x Tenmarq (C.I. 11973). Of the Kawvale x Tenmarq selections, C.I. 11669 had the best weight per bushel.

Table 20. - Summary of average yields of the 30 winter wheat varieties grown as uniform yield nurseries at 13 stations in the hard winter wheat region, 1940

Variety or cross	C.I.No.	Bushels per acre																										Average 13 stations
		Texas						Oklahoma				Kansas				Iowa		Nebraska				Colorado						
		Denton	Chillicothe	Bushland (Dryland)	Bushland (Irrigated)	Average	Rank	Stillwater	Woodward	Average	Rank	Hays	Manhattan	Average	Rank	Ames	Rank	Lincoln	North Platte	Alliance	Average	Rank	Fort Collins	Hesperus	Average	Rank	
Cheyenne x Tenmarq	11672	32.7	19.8	5.3	20.5	19.6	4	39.3	30.1	34.7	2	17.7	37.0	27.4	7	52.3	21	29.1	43.1	11.1	27.8	4	48.6	49.7	49.2	1	31.2
Kawvale x Tenmarq	11669	34.0	18.4	4.7	23.5	20.2	2	39.7	26.7	33.2	5	18.8	40.3	28.6	4	62.1	4	28.5	46.9	8.3	27.9	3	39.6	34.8	37.2	21	30.3
Kawvale x Tenmarq	11950	26.4	15.0	6.6	24.3	18.1	22	41.2	29.2	35.2	1	17.9	42.5	30.2	1	53.3	16	31.5	35.7	9.0	25.4	14	52.8	36.3	44.6	4	30.1
Kanred-Ward Federation x Tenmarq	11974	32.8	18.4	5.1	21.3	19.4	8	36.9	30.7	33.8	4	18.3	33.2	25.8	14	57.8	9	29.1	39.1	12.4	26.9	8	44.1	41.1	42.6	5	30.0
Kawvale x Tenmarq	11750	29.9	17.7	4.8	20.5	18.2	19	38.3	27.0	32.7	7	14.8	36.7	25.8	14	65.2	1	26.9	44.3	11.3	27.5	6	45.4	31.7	38.6	16	29.6
Kawvale x Tenmarq	11956	38.6	18.3	6.2	21.1	20.6	1	37.7	30.1	33.9	3	18.6	36.6	27.6	6	52.7	19	27.9	36.8	10.6	25.1	17	45.1	34.7	39.9	11	29.6
Early Blackhull Hybrid	11846	26.7	16.8	5.5	19.8	17.2	25	30.2	22.7	26.5	23	18.0	36.6	27.3	9	59.2	8	31.4	45.9	7.8	28.4	1	48.2	42.4	45.3	3	29.4
Tenmarq x Nebraska No. 28	11847	38.2	20.4	5.2	17.0	20.2	2	33.1	25.9	29.6	17	17.7	32.5	25.1	18	61.0	5	32.0	36.8	7.5	25.4	14	46.3	35.9	41.1	8	29.3
Kanred x Blackhull	11844	27.0	22.5	5.0	23.8	19.6	4	35.8	27.4	31.6	9	18.8	36.7	27.8	5	49.1	25	29.4	41.3	8.8	26.5	10	47.1	36.4	41.8	7	29.2
Oro x Tenmarq	11673	32.3	20.9	4.8	14.7	18.2	19	23.9	26.0	25.0	27	18.0	36.7	27.4	7	53.0	18	31.5	40.7	7.8	26.7	9	44.9	48.8	46.9	2	28.9
Blackhull	6251	31.0	19.3	6.4	16.3	18.3	17	32.1	24.8	28.5	18	16.9	34.9	25.9	13	53.7	14	35.3	40.3	9.1	28.2	2	41.4	37.0	39.2	14	28.5
Tenmarq x Minturki	11580	31.9	17.5	4.8	22.6	19.2	9	32.6	26.5	29.6	15	20.2	33.8	27.0	10	64.8	2	27.2	35.8	8.5	23.8	22	46.0	27.5	36.3	23	28.5
Early Blackhull x Tenmarq	11952	36.5	19.5	4.5	16.4	19.2	9	35.3	26.4	30.9	11	18.5	41.0	29.8	2	60.9	6	29.9	32.7	10.5	24.4	20	41.3	24.3	32.8	29	28.4
Cheyenne x Tenmarq	11973	27.3	21.1	5.9	24.0	19.6	4	34.3	28.0	31.2	10	17.4	40.5	29.0	3	55.2	11	28.6	31.6	11.3	23.8	22	38.5	31.6	35.1	25	28.2
Kawvale x Tenmarq	11955	30.9	18.6	5.0	21.9	19.1	12	36.8	29.4	33.1	6	15.2	38.5	26.9	11	59.4	7	28.4	29.8	9.0	22.4	27	46.1	23.7	34.9	27	28.1
Martin x Tenmarq[3]	11823	27.5	21.3	6.6	18.5	18.5	16	32.1	27.7	29.9	13	16.4	31.9	24.2	22	55.9	10	25.7	39.5	9.8	25.0	18	44.6	34.4	39.5	12	28.0
Early Blackhull	8856	35.9	21.4	3.9	14.2	18.9	13	29.3	23.1	26.2	25	17.2	31.3	24.3	20	53.6	15	36.4	39.1	8.4	27.6	5	36.0	38.8	37.4	20	27.7
Kanred x Hope-Hard Federation	11975	31.6	16.1	4.6	21.0	18.3	17	35.6	28.5	32.1	8	15.9	26.8	21.4	29	52.6	20	31.8	37.9	9.0	26.2	11	41.1	34.0	37.6	19	27.6
Fort Collins selection	11971	29.0	19.3	5.0	21.5	18.7	14	26.3	28.8	27.6	21	15.5	35.9	25.7	16	62.7	3	30.0	31.1	7.6	22.9	25	44.9	27.3	36.1	24	27.5
Kanred x Hope	11976	31.3	17.0	5.5	19.1	18.2	19	33.9	26.0	30.0	12	16.1	29.0	22.6	26	51.0	23	31.5	37.9	6.2	25.2	16	36.0	42.7	39.4	13	27.4
Nebred	10094	29.6	12.5	5.5	21.2	17.2	25	29.3	26.3	27.8	19	16.0	32.6	24.3	20	51.8	22	30.9	41.1	9.1	27.0	7	43.4	32.5	38.0	18	27.3
Sibley 62	11523	25.7	18.8	5.1	18.9	17.1	27	32.6	27.2	29.9	13	14.8	35.2	25.0	19	42.2	30	29.2	39.9	9.2	26.1	12	39.2	38.3	38.8	15	26.9
Martin x Tenmarq[3]	11805	28.6	21.6	5.6	22.5	19.6	4	26.0	27.2	26.6	22	16.7	29.0	22.9	25	53.2	17	22.9	32.9	8.1	21.3	29	51.2	22.9	37.1	22	26.3
Kanred-Ed.Fed. x Minhardi-Minturki	11970	29.4	20.0	5.6	15.3	17.6	24	22.0	27.1	24.6	28	14.9	28.1	21.5	28	53.9	13	27.8	30.9	8.6	22.4	27	39.7	44.7	42.2	6	26.3
Oro x Fulhard	11579	25.4	20.9	5.9	19.8	18.0	23	30.5	25.1	27.8	19	15.2	37.4	26.3	12	45.4	29	28.5	36.4	8.6	24.5	19	38.2	27.4	32.8	29	26.1
Kanred x Marquis	11746	24.8	17.5	4.6	16.7	15.9	28	28.9	24.1	26.5	23	14.5	32.7	23.6	24	49.7	24	24.3	36.3	8.0	22.9	25	44.0	36.7	40.4	10	25.9
Cheyenne selection	11666	31.9	20.4	5.1	18.8	18.6	15	----	27.8	----	--	17.0	33.5	25.2	17	54.5	12	32.9	36.0	8.3	25.7	13	42.1	34.7	38.4	17	25.8
Hope x Cheyenne	11969	33.0	16.3	5.3	22.3	19.2	9	36.4	22.7	29.6	15	16.5	27.8	22.2	27	48.3	27	24.1	29.1	8.4	19.9	30	43.3	26.8	35.1	25	25.6
Kharkof	1442	19.2	13.2	5.0	17.9	13.8	30	29.2	21.5	25.4	26	11.3	36.8	24.1	23	48.4	26	30.3	32.5	10.0	24.3	21	46.3	34.7	40.5	9	25.5
Compound Cross	11977	22.3	15.2	6.2	16.5	15.1	29	18.0	20.5	19.3	29	15.6	23.7	19.7	30	48.3	27	29.3	33.3	8.5	23.7	24	30.3	39.0	34.7	28	23.3
Standard error of a mean (bushels)		2.27	2.44	0.59	2.08	0.99		2.06	1.62	1.31		1.49	3.07	1.71		----		3.11	3.01	0.93	1.48		2.76	6.74	3.64		----
Standard error of a mean (percent)		7.56	13.22	11.11	10.59	5.41		6.38	6.12	4.42		8.97	8.95	6.34		----		10.59	8.11	10.38	5.63		6.39	19.24	10.14		----

Table 21. - Summary of average yields of 21 winter wheat varieties grown in uniform yield nurseries at 11 stations in the hard red winter wheat region, 1939-40

Variety or cross	C.I.No.	Bushels per acre																					Average
		Texas					Oklahoma				Kansas		Nebraska					Colorado					11
		Denton	Bushland	Chillicothe	Average	Rank	Stillwater	Woodward	Average	Rank	Hays	Rank	Lincoln	North Platte	Alliance	Average	Rank	Fort Collins	Hesperus	Average	Rank	stations
Kawvale x Tenmarq	11950	29.9	13.0	17.6	20.2	13	39.1	31.9	35.5	1	18.5	1	33.3	32.5	20.3	28.7	4	58.6	44.4	51.5	2	30.8
Oro x Tenmarq	11673	29.9	11.4	24.3	21.9	7	28.4	28.1	28.3	14	17.9	3	30.8	34.8	20.3	28.6	5	49.1	54.7	51.9	1	30.0
Kawvale x Tenmarq	11669	32.4	13.1	23.2	22.9	3	34.1	28.6	31.4	5	16.2	9	30.1	38.7	19.7	29.5	1	49.4	41.5	45.5	8	29.7
Early Blackhull x Tenmarq	11952	34.3	13.3	20.3	22.6	4	36.8	30.2	33.5	2	18.1	2	32.0	32.3	22.3	28.9	2	51.0	36.2	43.6	13	29.7
Kanred x Blackhull	11844	26.9	11.5	24.4	20.9	10	30.9	27.3	29.1	10	17.4	7	29.7	32.3	17.4	26.5	13	56.8	44.8	50.8	3	29.0
Kawvale x Tenmarq	11750	31.7	11.1	22.2	21.7	8	34.3	28.9	31.6	4	14.0	18	28.3	35.8	22.4	28.8	3	50.3	34.6	42.5	17	28.5
Early Blackhull	8856	33.2	13.2	26.6	24.3	1	32.6	27.3	30.0	6	17.8	4	33.8	32.9	18.6	28.4	6	43.6	33.0	38.3	21	28.4
Tenmarq x Nebraska No. 28	11847	33.4	12.0	24.1	23.2	2	31.5	27.3	29.4	9	17.6	6	31.0	30.9	17.2	26.4	15	46.9	40.9	43.9	11	28.4
Kanred-Hard Federation x Minhardi-Minturki	11970	26.6	12.4	22.9	20.6	11	27.7	30.5	29.1	10	15.6	11	30.3	27.7	18.7	25.6	16	49.9	47.8	48.9	4	28.2
Blackhull	6251	28.9	12.2	24.9	22.0	6	32.0	27.3	29.7	7	15.4	12	32.2	31.0	18.0	27.1	9	44.8	40.9	42.9	16	28.0
Early Blackhull Hybrid	11846	26.3	11.1	17.6	18.3	20	28.3	26.0	27.2	18	17.8	4	29.3	35.3	19.0	27.9	8	55.2	41.0	48.1	6	27.9
Fort Collins selection	11971	23.6	11.5	20.1	18.4	19	27.3	30.9	29.1	10	16.9	10	30.1	30.2	20.1	26.8	11	54.0	42.3	48.2	5	27.8
Kawvale x Tenmarq	11963	29.9	10.8	23.6	21.4	9	34.5	31.9	33.2	3	14.7	15	29.2	28.4	17.2	24.9	18	47.7	35.2	41.5	19	27.6
Cheyenne selection	11666	23.9	11.5	22.8	19.4	16	----	27.9	----	-	15.0	13	30.5	30.8	19.6	27.0	10	50.0	42.2	46.1	7	27.4[1]
Tenmarq x Minturki	11680	29.3	11.3	20.6	20.4	12	28.0	28.1	28.1	15	17.3	8	27.9	31.4	20.1	26.5	13	49.9	36.9	43.4	14	27.3
Sibley 62	11523	23.9	11.0	23.8	19.6	15	28.7	30.3	29.5	8	12.4	20	29.6	32.3	18.2	26.7	12	46.5	41.2	43.9	11	27.1
Nebred	10094	23.7	11.6	24.7	20.0	14	28.0	29.0	28.5	13	14.6	16	30.3	33.5	20.8	28.2	7	47.2	32.0	39.6	20	26.9
Martin x Tenmarq[3]	11805	30.0	11.7	24.6	22.1	5	25.9	27.0	26.5	19	15.0	13	27.2	28.3	18.8	24.8	19	54.3	32.1	43.2	15	26.8
Oro x Fulhard	11579	22.6	10.3	23.5	18.8	17	28.4	27.5	28.0	16	14.5	17	27.4	29.8	17.7	25.0	17	42.8	40.4	41.6	18	25.9
Kanred x Marquis	11746	25.1	8.9	21.9	18.6	18	28.8	24.2	26.5	19	13.4	19	25.1	28.9	16.3	23.4	21	47.6	40.6	44.1	10	25.5
Kharkof	1442	19.3	9.6	18.1	15.7	21	27.8	27.2	27.5	17	10.1	21	27.9	28.1	18.1	24.7	20	52.8	37.2	45.0	9	25.1

1/ Excluding Stillwater.

Table 22. - 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, 1940

Variety or cross	C.I. number	Average Date Headed	Date Ripe	Height	Lodging	Rust Leaf	Rust Stem	Shattering	Kernel plumpness	Weight per bu.
		May		(In.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Pct.)	(Lbs.)
Number of stations		11	12	14	4	2	2	2	5	11
Kharkof	1442	28	July 1	32.3	21	65	27	3	85	57.8
Blackhull	6251	25	June 30	33.7	19	49	11	5	86	60.4
Early Blackhull	8856	17	June 25	31.5	7	60	5	0	87	60.9 1/
Nebred	10094	27	June 30	30.9	11	58	8	0	86	59.4
Sibley 62	11523	26	June 30	32.1	38	30	32	23	86	58.3
Early Blackhull Hybrid	11846	24	June 29	32.9	23	30	35	28	86	58.4
Tenmarq x Nebraska No. 28	11847	25	June 29	33.2	5	35	17	26	86	60.3
Oro x Tenmarq	11673	22	June 28	31.7 2/	16	12	22	4	85	59.1
Cheyenne selection	11666	26	July 1 2/	30.0 2/	14	53	11	4	86	59.0 2/
Kanred x Blackhull	11844	24	June 29	32.0	10	33	32	24	85	58.8
Kanred x Marquis	11746	25	June 30	32.1	3	26	35	26	82	58.5
Oro x Fulhard	11579	26	June 30	31.3	22	52	27	23	88	59.2
Kawvale x Tenmarq	11669	22	June 27	30.6	3	7	10	7	83	59.3
Kawvale x Tenmarq	11750	23	June 27	30.7	3	5	7	12	81	57.6
Hope x Cheyenne	11969	25	June 29	30.3	20	4	1	0	83	57.4
Tenmarq x Minturki	11580	24	June 29	31.7	25	38	31	5	83	58.4
Kawvale x Tenmarq	11950	22	June 26	31.9	26	7	44	7	81	58.1
Early Blackhull x Tenmarq	11952	22	June 26	30.8	25	71	10	6	90	61.5
Martin x Tenmarq[3]	11805	25	June 29	32.1	23	39	30	7	82	56.6
Kawvale x Tenmarq	11953	26	June 28	30.8	13	12	21	51	80	57.0
Kanred-Hard Federation x Minhardi-Minturki	11970	23	June 29	33.7	7	53	50	10	85	58.5 3/
Fort Collins selection	11971	25	June 29	31.8	13	82	18	27	83	58.4
Cheyenne x Tenmarq	11972	25	June 29	30.9	27	25	36	12	88	58.9
Cheyenne x Tenmarq	11973	25	June 28	30.9	25	29	60	4	89	60.2 3/
Kawvale x Tenmarq	11956	26	June 28	31.1	24	9	12	33	84	58.9
Martin x Tenmarq[3]	11823	25	June 29	32.1	23	25	30	9	79	55.7
Kanred-Hard Federation x Tenmarq	11974	22	June 27	30.6	18	26	32	9	83	57.2
Kanred x Hope-Hard Federation	11975	21	June 28	31.1	5	39	4	7	84	58.5
Kanred x Hope	11976	23	June 28	31.4	3	72	3	11	83	57.1
Compound Cross	11977	24	June 30	30.9	3	66	28	0	83	57.4

1/ Excluding Bushland (Irrigated).
2/ Excluding Stillwater.
3/ No test weight at Stillwater.

DATA FROM THE DISEASE NURSERIES

BUNT NURSERY

For convenience the data from the uniform winter wheat bunt nursery are included in this report. These data (table 23) were secured in cooperation with Agronomists and Pathologists working in the area.

UNITED STATES DEPARTMENT OF AGRICULTURE

Bureau of Plant Industry

SUMMARY OF THE GREAT PLAINS UNIFORM WINTER WHEAT BUNT NURSERY, 1940

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The uniform winter wheat bunt nursery for the Great Plains area was continued in 1940 in the same manner as in previous years. This report presents a summary of the data obtained in 1940, together with averages for the varieties grown during different periods from 1932 to 1940.

In the fall of 1939, 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., Arlington, Va., and Logan, Utah. Because of unfavorable environmental conditions for bunt infection or subsequent plant growth no data were obtained in the nurseries seeded at Akron, Colo., Bozeman, Mont., Arlington, Va., and Logan, Utah. Data from 10 nurseries are recorded and averaged in the table. The nursery included varieties that had shown resistance in previous years and interesting new strains supplied by several of the cooperating stations.

Inoculum for most stations was obtained from the previous year's nursery at that station by selecting bunted heads from all infected varieties, and from collections made from farmers' fields in the State where the test was made. For the Manhattan experiment the inoculum was a composite of races known to be present in Kansas. For the Kearneysville and Arlington tests the seed was inoculated with a composite made up of inoculum from all of the other nurseries.

The varieties are listed in order of the average infection at the 10 stations. These averages ranged from 0.5 to 65.4 percent. The average infections of some standard varieties were as follows: Hussar, 0.6; Relief, 0.6; Ridit, 2.3; Nebred, 2.8; Minturki, 3.3; Yogo, 3.8; and Oro, 6.9. The check varieties Kharkof, Quivira, and Cheyenne had average infections ranging from 39 to 50 percent, and Chiefkan 62.3 percent. Two hybrid strains had averages lower than Relief and Hussar, and nine other selections and hybrids showed less infection than did Ridit. Two Hope x Turkey 1069 strains had average infections lower than the parent Turkey 1069 (C.I. 10016), while other selections from the same cross were considerably higher.

At the bottom of the table are shown the average infections by stations. The heaviest infections were obtained at Kearneysville, Denton, and Fort Collins. A study of the Woodward, Manhattan, and Fort Collins data gives some indication that different forms may be present at these stations, although the differences are not as distinct as they were last year.

Long time averages are shown for varieties grown for more than one year. For the period 1932-40, Turkey selection (C.I. 10016) and Nebred had averages slightly lower than Hussar. For the last three years Hope x Hussar (C.I. 11834), Relief, and Kanred x Ridit (C.I. 11840) had the lowest average infections for the last two years. Several of the varieties that have been highly resistant in these tests and are otherwise agronomically desirable will now be tested with individual races that have been identified in all of the wheat growing areas.

Table [illegible] 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 1940, and average bunt infections for 1932-40

Variety or cross	C.I.No.	Average percentage of bunt at: Denton, Texas	Amarillo, Texas	Stillwater, Okla.	Woodward, Okla.	Manhattan, Kansas	Fort Collins, Colo.	Lincoln, Nebraska	North Platte, Nebraska	St. Paul, Minn.	Kearneysville, W. Va.	Average 10 stations 1940	Weighted average 1939 and 1940	Weighted average 1938 to 1940	Weighted average 1932 to 1940
Oro x Tenmarq	11807	0.0	0.0	0.3	0.2	0.0	4.7	0.0	0.1	0.0	0.0	0.5	1.9	2.0	----
Hope x Hussar	11834	2.0	0.0	0.3	0.3	1.7	0.2	0.0	0.0	0.7	0.0	0.5	0.7	0.6	----
Hussar	4843	0.0	0.0	0.0	0.0	2.5	0.5	0.0	0.0	0.8	2.5	0.6	1.5	4.3	3.3
Relief	10082	0.0	0.0	0.0	0.0	4.7	0.0	0.2	0.0	0.0	1.5	0.6	0.9	0.6	----
Hope x Turkey 1069	11964	0.5	0.4	1.3	0.3	0.6	1.3	1.0	0.0	0.0	4.0	0.9	0.9	---	----
Kanred x Ridit	11840	1.2	0.4	0.0	0.7	0.5	0.3	1.6	0.3	2.4	2.5	1.0	0.9	0.9	----
Cheyenne selection	11666	0.7	0.0	1.0	0.5	0.5	6.2	1.1	0.4	1.6	0.0	1.2	1.3	1.1	----
Hussar x Kanred	11989	1.3	0.4	3.8	1.4	1.7	0.8	2.4	0.5	1.4	0.5	1.4	---	---	----
Hope x Turkey 1069	11966	0.8	0.0	0.8	0.2	0.9	10.0	2.2	0.0	0.0	0.5	1.5	2.0	---	----
Oro x Tenmarq	11830	1.5	0.0	2.0	0.5	1.1	7.0	1.5	1.5	0.0	0.5	1.6	3.4	4.2	----
Turkey selection	11841	0.4	0.4	0.5	0.0	0.8	7.4	2.4	0.6	0.6	3.0	1.6	2.6	2.3	----
Kanred x Minturki	11839	0.9	0.0	2.2	0.2	1.1	9.5	1.6	0.6	0.0	3.0	1.9	2.5	2.1	----
Turkey selection	11965	0.8	0.2	4.5	0.9	1.3	8.8	1.4	0.4	0.6	2.5	2.1	2.8	---	----
Ridit	6703	2.9	0.0	4.3	3.0	5.1	1.9	2.7	0.8	1.2	1.0	2.3	3.9	6.9	4.8
Turkey selection	11984	3.0	0.2	0.8	1.2	1.2	12.0	2.0	0.5	0.6	1.5	2.3	---	---	----
Turkey selection	11962	2.7	0.0	0.2	1.2	2.3	9.7	2.1	0.1	1.5	4.5	2.4	2.0	---	----
Turkey selection	10016	1.5	1.0	1.4	1.5	6.8	8.3	1.4	1.0	0.3	3.0	2.6	2.6	2.0	1.7
Turkey selection	11963	1.0	1.0	4.0	0.8	1.4	9.8	1.4	0.5	1.1	5.0	2.6	2.7	---	----
Tenmarq x Minturki	11833	5.6	0.9	2.8	2.5	3.3	4.5	6.0	0.1	0.6	1.0	2.7	2.6	2.4	----
Blackhull x Oro	11961	1.3	1.0	0.3	0.4	1.1	16.4	3.1	1.2	1.2	1.0	2.7	4.3	---	----
Nebred	10094	4.9	0.0	1.9	0.8	1.8	8.3	4.6	0.9	1.2	3.5	2.8	2.9	2.4	2.2
Martin x Tenmarq[3]	11805	0.7	0.0	0.0	0.7	9.6	0.2	0.6	0.0	2.3	15.0	2.9	4.3	3.2	----
Martin x Tenmarq[3]	11824	0.7	0.0	0.0	1.7	5.0	0.0	0.2	0.0	3.1	18.0	2.9	4.2	3.5	----
Turkey selection	11985	3.3	1.0	3.8	0.9	2.5	6.7	0.6	1.8	3.7	5.0	2.9	---	---	----
Hussar x Kanred	11981	1.5	1.0	1.0	1.5	6.4	0.5	0.2	2.0	0.8	15.0	3.0	---	---	----
Minturki	6155	9.6	0.3	2.5	1.1	2.8	7.2	3.8	1.3	1.3	3.5	3.3	3.4	3.5	5.3
Turkey 1069 x Quivira	11990	2.0	0.9	0.0	0.2	1.4	24.4	1.5	0.5	0.8	1.5	3.3	---	---	----
Hope x Turkey 1069	11988	4.4	0.0	3.3	0.7	3.3	10.8	2.2	0.8	0.6	8.5	3.5	---	---	----
Tenmarq x Minturki	11982	4.0	1.0	4.3	2.3	6.0	8.0	3.7	0.9	1.1	4.5	3.6	---	---	----
Yogo	8033	1.2	1.2	4.4	1.8	2.6	19.3	3.2	0.3	1.2	3.0	3.8	4.2	3.7	2.8
Quivira x Fulhard-Oro	11954	4.2	0.5	3.0	2.9	2.9	15.4	4.9	0.9	2.2	1.5	3.8	6.6	---	----
Martin x Tenmarq[3]	11804	0.0	0.0	0.0	0.2	10.6	0.2	0.2	0.2	3.4	30.0	4.5	5.6	4.5	----
Oro x Tenmarq	11673	8.8	1.3	3.3	2.3	3.5	12.7	10.9	1.0	1.9	0.0	4.6	5.1	5.4	----
Turkey 1069 x Cheyenne	11983	6.0	0.0	3.3	3.7	3.9	19.5	7.3	2.2	0.9	1.5	4.8	---	---	----
Turkey selection	11530	1.4	0.0	0.0	0.0	9.0	0.4	0.2	0.1	5.7	35.0	5.2	---	---	----
Martin x Tenmarq[3]	11823	0.0	0.0	1.0	0.7	7.8	0.0	0.0	0.6	2.1	45.0	5.7	4.9	3.8	----
Marquillo x Oro	11851	19.3	0.7	0.8	3.3	9.4	14.2	9.4	0.9	2.3	1.5	6.2	7.4	---	----
Marquillo x Oro	11950	8.5	0.9	0.9	0.9	6.0	31.7	8.6	1.0	1.0	2.5	6.2	---	---	----
Marquillo x Oro	11955	16.0	2.9	1.0	4.5	4.5	27.7	5.6	0.9	1.6	2.0	6.7	7.4	---	----
Oro	8220	13.8	2.4	5.0	7.0	6.9	15.9	7.4	1.5	3.6	5.5	6.9	8.5	7.5	6.0
Marquillo x Oro	11979	16.7	1.0	5.6	4.3	9.4	25.8	5.3	0.6	1.8	2.5	7.3	---	---	----
Marquillo x Oro	11978	26.7	2.4	2.0	4.5	11.4	20.9	3.7	0.7	2.0	1.0	7.5	---	---	----
Hope x Turkey 1069	11986	20.2	0.7	14.5	5.9	13.6	9.9	10.6	5.7	2.8	27.5	11.1	---	---	----
Hope x Turkey 1069	11987	27.4	1.0	12.3	17.2	17.2	5.3	19.1	6.1	1.8	17.5	12.5	---	---	----
Turkey 1069 x Cheyenne	11991	31.7	1.9	24.0	19.5	26.4	18.0	15.0	28.9	3.8	40.0	20.9	----	---	----
Hope x Kawvale	11969	29.9	0.4	29.3	13.2	26.1	4.0	18.4	19.8	5.6	75.0	22.2	19.5	---	----
Kharkof	1442	69.2	14.5	53.1	32.9	28.3	35.2	28.7	31.0	17.7	70.0	38.1	39.8	38.8	42.8
Quivira	8886	68.9	4.0	60.5	57.8	30.9	30.9	37.7	51.2	17.0	90.0	44.9	50.9	50.5	46.0
Cheyenne	8885	77.9	12.9	68.5	58.7	58.7	36.7	57.1	47.2	22.7	85.0	52.5	49.4	45.4	44.3
Chiefkan	11754	94.9	21.9	86.0	74.7	72.3	43.8	45.2	75.5	45.3	94.5	65.4	62.3	----	----
Average		12.0	1.6	8.5	6.8	8.8	11.5	7.0	5.9	3.5	14.9				

UNIFORM WINTER WHEAT RUST NURSERIES

In tables 24 and 25 are presented the data on severity of leaf rust and stem rust infection on the 30 varieties of winter wheat grown in rust observation nurseries throughout the country in 1940. These nurseries are maintained from year to year as part of a rust research program carried on in cooperation with agronomists and pathologists employed in the several States concerned. Later, 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 include only figures for the severity of infection.

Differential data for leaf-rust infection were obtained for the varieties at 17 stations (table 24). In calculating the average, a trace (T) is considered as equal to 0. Among the semi-hard wheats Hope x Hussar (C.I. 11682), Hope x Kawvalo (C.I. 11959), and Red Rock x Hope (C.I. 11821) had the lowest average infections. Of the hard wheats only Marquillo x Oro (C.I. 11851) had an average less than 10 percent, while Oro x Tenmarq (C.I. 11673), Hope x Cheyenne (C.I. 11969), and Marquillo x Oro (C.I. 11979) averaged slightly higher. Fulcaster had an average infection of 57.1 percent.

Stem-rust readings showing differential reaction were reported from 20 stations (table 25). Among the hard wheats the most marked resistance was shown by Hope x Cheyenne (C.I. 11969), Hope x Turkey 1069 (C.I. 11964), and Marquillo x Oro (C.I. 11979). Hope x Kawvale (C.I. 11959), Hope x Mediterranean (C.I. 11763), and Hope x Hussar (C.I. 11682), all classed as semi-hard, had low average infections.

Table 24. – Severity of leaf rust infection on winter wheat varieties grown in the Uniform Rust Observation Nurseries in 1940

Variety or cross	C. I. No.	Percent severity of leaf rust infection at: Arlington Farm, Va.	Chilhowie, Va.	Blacksburg, Va.	Elk Creek, Va.	Jackson's Ferry, Va.	Gainesville, Fla.	Wooster, Ohio	Lexington Ky.	Lafayette Ind.	Urbana, Illinois	Univ. Farm, Fayetteville, Ark.	Ames, Iowa	Columbia Mo.	Lincoln, Nebr.	Manhattan Kansas	Stillwater Oklahoma	Denton, Texas	Average for 17 stations
Soft Red:																			
Michigan Amber	5620	90	90	75	70	95	0	90	30	100	70	T	10	40	5	10	T	60	49.1
Trumbull	5657	85	85	95	80	65	20	85	65	100	70	T	15	65	5	10	T	50	52.6
Denton	8265	90	45	60	15	50	T	20	20	15	50	10	10	25	T	T	T	15	25.0
Fulcaster	6471	90	90	95	90	80	T	90	80	100	75	T	25	65	10	20	T	60	57.1
Mediterranean	3332	85	95	95	85	95	10	95	70	75	55	T	20	50	T	T	T	40	51.2
Minhardi	5149	90	90	90	65	90	5	90	45	95	75	T	30	45	5	60	5	80	56.5
Purdue No. 1	11380	85	55	85	30	65	1	85	85	95	50	T	10	60	5	T	T	60	45.4
Wabash	11384	80	40	20	5	15	0	50	40	2	25	T	1	25	T	T	T	5	18.1
Fultz sel. x Hungarian sel.	11849	90	20	15	T	10	0	15	65	T	10	T	0.2	20	T	T	T	T	14.4
Fultz sel. x Hungarian sel.	11850	95	25	25	3	10	0	65	40	2	10	T	0.2	15	T	T	T	T	17.1
Fultz sel. x Hungarian sel.	12017	90	20	25	1	5	0	40	75	T	10	0	0.1	20	T	T	T	T	16.8
Fultz sel. x Trumbull	12018	65	20	40	10	10	0	60	70	2	15	T	4	15	T	T	T	2	18.4
Semi-hard Red:																			
Hussar	4843	65	25	30	10	30	T	25	80	20	60	T	35	35	15	5	2	70	29.8
Kawvale	8180	75	20	15	1	25	0	40	20	15	50	T	20	15	T	T	T	25	18.9
Minturki	6155	85	60	60	60	65	5	90	75	50	75	T	40	45	5	40	5	80	49.4
Hope x Hussar	11682	15	10	5	T	10	0	5	5	T	10	T	0.2	1	T	T	T	2	3.7
Hope x Mediterranean	11763	75	20	20	10	50	T	5	5	T	5	T	0.1	3	T	T	T	5	11.7
Hope x Kawvale	11822	85	40	40	2	40	T	80	10	15	5	T	0.1	2	T	T	T	T-40	19.9
Hope x Kawvale	11959	5	20	35	T	10	0	1	7	T	5	T	0.1	2	T	T	T	2	5.1
Red Rock x Hope	11821	65	5	5	1	20	T	T	3	T	10	T	0.1	2	T	T	T	2	6.7
Hard Red:																			
Kanred	5146	80	5	25	10	55	1	50	25	30	35	T	20	20	5	10	10	60	25.9
Tenmarq	6936	80	25	35	10	30	5	90	60	50	20	0	20	40	T	5	5	45	30.6
Kharkof	1442	85	60	50	45	60	2	50	60	30	30	T	25	40	5	40	15	80	39.8
Malakof	4898	90	55	10	20	50	T	30	50	35	30	T	20	50	5	40	10	70	33.2
Oro x Tenmarq	11673	60	1	10	0	10	2	10	10	2	20	T	10	20	T	T	T	10	10.3
Kawvale x Tenmarq	11669	90	60	10	3	5	0	50	50	20	40	T	10	20	T	T	T	20	22.2
Kawvale x Tenmarq	11956	60	40	10	1	25	0	40	40	20	30	T	5	25	T	T	T	10	18.0
Marquillo x Oro	11851	65	10	15	T	10	0	5	5	T	10	T	0.3	5	T	T	T	15	8.3
Marquillo x Oro	11979	85	30	15	T	30	1	T	0	T	10	T	0.2	5	T	T	T	10	11.0
Hope x Turkey	11964	65	60	30	5	20	0	T	3	35	10	T	2	5	T	2	T-5	60	17.6
Hope x Cheyenne	11969	5	65	15	T	40	-	0	10	T	10	T	5	10	T	5	T	5	10.6

Table 25. - Severity of stem rust infection on winter wheat varieties grown in the Uniform Rust Observation Nurseries in 1940

Variety or cross	C.I. number	Percent severity of stem rust infection at: Arlington Farm, Va.	Chilhowie, Va.	Blacksburg, Va.	Elk Creek, Va.	Jackson's Ferry, Va.	Wooster, Ohio	Lexington, Kentucky	Lafayette, Indiana	Bedford, Indiana	Chatham, Michigan	Madison, Wisconsin	Urbana, Illinois	Ames, Iowa	Kanawha, Iowa	Columbia, Missouri	Lincoln, Nebraska	Manhatten, Kansas	Stillwater, Oklahoma	Denton, Texas	College Station, Tex.	Average for 20 stations
Soft Red:																						
Michigan Amber	5620	95	65	1	25	85	60	0	20	100	100	30	40	10	75	40	5	25	10	45	85	45.8
Trumbull	5657	95	50	1	20	90	2	0	10	90	100	25	40	15	60	30	5	25	5	40	85	39.4
Denton	8265	95	75	1	60	90	25	0	10	90	100	10	50	25	60	30	2	25	10	50	80	44.4
Fulcaster	6471	97	85	1	50	90	10	0	10	75	100	25	40	30	60	40	2	25	5	50	80	43.8
Mediterranean	3332	98	85	1	65	85	35	0	15	75	100	10	35	30	70	35	2	25	5	50	70	44.6
Minhardi	5149	92	90	1	70	75	40	10	35	100	95	30	50	35	75	45	10	40	10	60	85	52.4
Purdue No. 1	11380	95	85	T	60	90	1	0	15	90	98	5	50	35	50	30	5	30	5	60	85	44.5
Wabash	11384	90	85	1	80	90	20	10	5	90	100	10	50	40	70	25	8	25	10	45	65	47.0
Fultz sel. x Hungarian sel.	11849	95	90	1	65	95	15	60	15	90	95	5	65	40	60	30	12	40	10	45	65	49.7
Fultz sel. x Hungarian sel.	11850	90	65	T	60	95	45	10	10	100	98	3	65	35	60	30	8	40	5	45	65	46.5
Fultz sel. x Hungarian sel.	12017	90	70	2	50	95	15	5	0.5	100	100	10	65	50	65	30	10	30	5	50	70	45.9
Fultz sel. x Trumbull	12018	95	85	T	70	80	50	20	10	100	100	5	65	40	60	25	5	30	5	50	80	48.8
Semi-hard Red:																						
Hussar	4843	95	90	T	50	90	20	10	20	90	100	10	40	40	75	40	5	40	5	50	80	47.5
Kawvale	8180	85	45	0	30	65	5	5	T	50	100	2	30	30	55	5	3	10	2	15	65	30.1
Minturki	6155	85	65	0	5	60	10	0	T	90	100	1	25	20	40	4	T	25	5	15	25	28.8
Hope x Hussar	11682	5	60	T	50	25	0	0	0	T	2	0	1	0	2	0.2	T	T	T	T	T	7.3
Hope x Mediterranean	11763	10	10	0	3	10	10	0	0	10	40	10	5	5	2	4	T	T	1	2	T-40	8.1
Hope x Kawvale	11822	65	5	0	T	5	10	0	0	10	75	20	15	5	5	0.2	T	T	T	5	15	11.8
Hope x Kawvale	11959	3	5	0	0	5	1	0	0	T	1	0	15	0.2	5	0.2	T	T	T	T	T	1.8
Red Rock x Hope	11821	15	1	0	1	20	3	T	0	50	90	0	20	5	20	20	1	5	T	1	20	13.6
Hard Red:																						
Kanred	5146	80	3	0	T	50	5	0	T	75	80	3	20	15	30	10	T	10	T	20	80	24.1
Tenmarq	6936	85	10	0	1	40	T	0	3	75	90	5	20	15	40	10	T	20	T	25	80	26.0
Kharkof	1442	90	10	0	T	60	50	0	T	90	90	3	30	25	75	20	1	20	2	25	80	33.6
Malakof	4898	80	0	0	3	60	5	1	T	90	85	2	30	35	75	15	1	25	2	5	80	29.7
Oro x Tenmarq	11673	85	T	0	T	70	0	0	T	50	75	2	10	10	40	5	T	15	T	5	65	21.6
Kawvale x Tenmarq	11669	95	T	0	T	75	0	0	0	75	90	1	15	20	40	7	T	10	T	2	80	25.5
Kawvale x Tenmarq	11956	90	T	0	T	80	0	T	1	50	80	2	10	25	45	5	T	15	T	1	80	24.2
Marquillo x Oro	11851	70	T	0	0	10	0	0	0	15	25	0	5	5	25	3	T	T	T	1	40	10.0
Marquillo x Oro	11979	70	0	0	0	10	0	0	0	15	15	0.2	5	5	20	3	T	T	T	1	40	9.2
Hope x [illegible]	11964	5	0	0	0	3	0	0	0	T	35	0	5	0	5	1	T	T	T	T	T	2.7
Hope [illegible]	11969	3	0	0	0	5	0	0	0	[illegible]	[illegible]	0	5	0	2	1	T	T	T	T	T	[illegible]