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## Spring Wheat Varieties in South Dakota

S. P. Swenson

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# Spring Wheat Varieties in South Dakota



The image displays three wheat spikes against a light background. The spike on the left is labeled 'Ceres' and has a moderate number of long awns. The middle spike is labeled 'Mindum' and has a significantly higher density of long awns. The spike on the right is labeled 'Thatcher' and has a much shorter spike with fewer, shorter awns.

Ceres

Mindum

Thatcher

Agronomy Department  
AGRICULTURAL EXPERIMENT STATION  
South Dakota State College  
BROOKINGS, S. D.

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COVER PAGE—*The two leading recommended varieties of hard red spring wheat, Ceres and Thatcher, and the leading recommended variety of durum wheat, Mindum, are shown on the cover.*

## *Summary*

Wheat is South Dakota's second most important grain crop, ranking only below corn in acreage, production and farm value. Of the average annual acreage of 2,207,000 acres harvested during the period 1936-38, 1,587,000 acres were common spring wheat and 508,000 acres were durum wheat.

South Dakota produces three main classes of wheat—hard red spring, durum and hard red winter. Some hard white spring wheat also is grown.

The state of South Dakota may be divided into six wheat producing districts on the basis of types of wheat grown. These districts are used as bases for varietal recommendations. (See Figure 3, p 11).

The two most important varieties of hard red spring wheat in South Dakota are Ceres and Thatcher. The percentages of the total wheat acreage sown to these varieties in 1939 were 33.5 percent and 24.5 percent, respectively.

Pentad (Red durum) and Mindum occupied the largest percentages of the acreage among named durum wheat varieties with 8.6 percent and 1.1 percent, respectively.

The results of tests of common spring and durum wheat varieties at the Experiment Station in Brookings, the Experiment Sub-stations at Highmore, Eureka and Cottonwood, and on farms throughout the state are reported in this bulletin.

The period 1930-39, during which the tests were conducted, has been characterized by extreme seasonal variations in climate and other factors influencing the growth and yield of wheat.

Thatcher has been the outstanding variety of hard red spring wheat tested at Brookings. It yielded 21 percent more than Ceres and was equal to or only slightly inferior to the most promising new varieties in the 1/66 acre plots and rod rows. Among the newer varieties which have been distributed to farmers, Rival and Pilot appear to be promising but not superior to Thatcher except in leaf-rust resistance. Some of the newer varieties are highly resistant to leaf rust as contrasted to Thatcher.

At Highmore, Thatcher has maintained a slightly higher yield than Ceres but the difference is not considered significant. Reward also has given good yields. Both Ceres and Reward have been superior in test weight. Rival and Pilot have been exceeded in yield by Thatcher at Highmore. A few of the newer varieties, although not much if any higher in yield, have been higher in test weight at Highmore.

Thatcher also has been the highest yielding variety at Eureka but as at Brookings and Highmore, its test weight has been lower than Ceres and Reward. Yields of the newer varieties were obtained only in 1939, Pilot being the only variety yielding as much as Thatcher.

Ceres and Reward have given the highest yields at Cottonwood. Thatcher has not been tested at Cottonwood.

For all stations, Mindum has given the best general performance of the durum varieties. At Highmore and Cottonwood, Arnautka and Kubanka also have given satisfactory performances.

Milling and baking tests show that Thatcher is an excellent milling wheat. Ceres, Reward and Marquis also possess excellent milling and baking qualities. Several of the newer varieties, among them Rival and Pilot, also appear promising.

Results from farmers' strip tests, conducted by the Extension Service and the Station Agronomy Department, corroborate the results obtained at the experiment stations.

A summary of varietal recommendations has been presented for the various wheat-producing districts. Thatcher and Ceres are the main varieties recommended.

Differences in yield and market prices would seem to justify a shift from durum to hard red spring wheat in northeastern South Dakota.

Brief descriptions and the origins of the varieties tested also have been given.

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# Spring Wheat Varieties in South Dakota

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## The Economic Importance of Wheat in South Dakota

Wheat is South Dakota's second most important grain crop, ranking only below corn in acreage, production and farm value, as shown in Table 1. Among the states, South Dakota usually ranks from tenth to fifteenth in total wheat production, maintaining an average rank of about twelfth place. South Dakota ranks second in durum wheat production, fifth or sixth in spring wheat production, and third or fourth in hard red spring wheat production.

A history and the trend of wheat production in South Dakota, up to and including 1930, were discussed by Klages (1931). Wheat production, as measured by the acreage harvested, increased rapidly from 1891 until the peak of 4,050,000 acres was reached in 1900. The acreage declined to 2,910,000 in 1907 but reached a second peak of 3,900,000 acres in 1913. From 1913 to 1926, the acreage showed a steady decline to 2,306,000 acres except for the year of 1919 when 3,896,000 acres were harvested.<sup>2</sup> By 1930, the acreage had increased again to 3,682,000 acres.

Klages (1931) also studied the trend in yield of wheat per harvested acre for the period 1891 to 1929, inclusive. The average yield was 11.3 bushels per acre and the trend was only slightly upward, the annual increment of increase amounting to only .005 of a bushel per acre. Since 1929, excepting the years 1930 and 1932, the yields have been considerably below average because of drought, grasshoppers and black stem rust. The comparison between the periods 1926-28 and 1936-38 in Table 1 serves to emphasize the reductions in yield which have been experienced.

In Table 1, it will be noted that the farm value of wheat is approximately equal to the combined values of oats and barley, and significantly exceeds

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1. The author wishes to express his appreciation to the following persons whose cooperation has made this bulletin possible: Dr. A. N. Hume, Agronomist and Superintendent of Substations; S. W. Sussex, Foreman of the Highmore Substation; Walter Schonbrodt and Edmund Stickel, former and present foremen, respectively, of the Eureka Substation; and Edgar Joy, former foreman of the Cottonwood Substation. The author also is indebted to U. J. Norgaard, Extension Agronomist; Rex Bankert, former Assistant Extension Agronomist and Ralph E. Johnston, former Extension Agronomist, for the data from the farmers' strip tests conducted by the South Dakota Extension Service and Station Agronomy Department, cooperating. The cooperation of Evan Jones, Agricultural Statistician, and Harold Walker, Assistant Agricultural Statistician, of the South Dakota Cooperative Crop and Livestock Reporting Service and that of J. A. Clark of the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, is also gratefully acknowledged.

2. The 1900, 1907, 1913, and 1919 figures have been revised since Klages' (1931) discussion. The revised figures have been used in this discussion.



Table 1. Comparative Importance of South Dakota Grain Crops With Respect to Acreages, Production, Yields, and Farm Values During the Two Three-year Periods, 1926-28 and 1936-38.<sup>1</sup>

CROP	ACRES HARVESTED		PRODUCTION IN BUSHELS		YIELDS IN BUSHELS Per Acre		FARM VALUE IN DOLLARS	
	1926-1928	1936-1938	1926-1928	1936-1938	1926-28	1936-38	1926-28	1936-1938
Corn	4,853,000	2,863,000	107,969,000	29,318,000	22.2	9.8	72,956,000	14,729,000
Wheat (All)	3,048,000	2,207,000	33,126,000	15,815,000	10.4	6.6	34,124,000	11,401,000
Common spring	1,822,000	1,587,000	19,074,000	10,569,000	9.9	6.3	19,773,000	8,088,000
Durum	1,133,000	508,000	12,847,000	4,058,000	11.3	6.8	13,117,000	2,403,000
Winter	93,000	112,000	1,205,000	1,187,000	12.5	10.8	1,234,000	910,000
Oats	2,407,000	1,302,000	56,873,000	29,821,000	23.2	21.7	20,703,000	6,607,000
Barley	1,231,000	1,179,000	25,231,000	19,325,000	19.5	15.7	13,853,000	7,544,000
Flax	497,000	50,000	3,475,000	247,000	6.9	5.1	6,652,000	421,000
Rye	142,000	471,000	1,795,000	5,964,000	12.2	11.3	1,386,000	2,644,000
Buckwheat	22,000	4,000	291,000	28,000	13.0	6.7	220,000	15,000

1. Data from reports of South Dakota Cooperative Crop and Livestock Reporting Service.

the value of any other small grain crop. These facts definitely bring out the point that wheat is South Dakota's most important small grain crop. Since climatic and soil conditions are usually favorable for wheat production in parts of South Dakota, wheat is likely to continue as one of the most important field crops of the state.

### The Distribution of Wheat Production in South Dakota

South Dakota produces three main classes of wheat—hard red spring, durum and hard red winter. A small amount of hard white spring wheat also is produced but in this discussion, it will be combined with hard red spring wheat under the title of common spring wheat. The relative amounts of these three classes are shown in Table 1.

The distributions of the acreages of common spring and durum wheat are shown in Figs. 1 and 2, respectively. The bulk of the acreage and production of common spring wheat is found in the north central and north-eastern portions. Since the introduction of Thatcher wheat in 1935 or 1936, the acreage has increased in the northeastern and eastern areas where black stem rust is a serious factor. Durum wheat production is confined mostly to

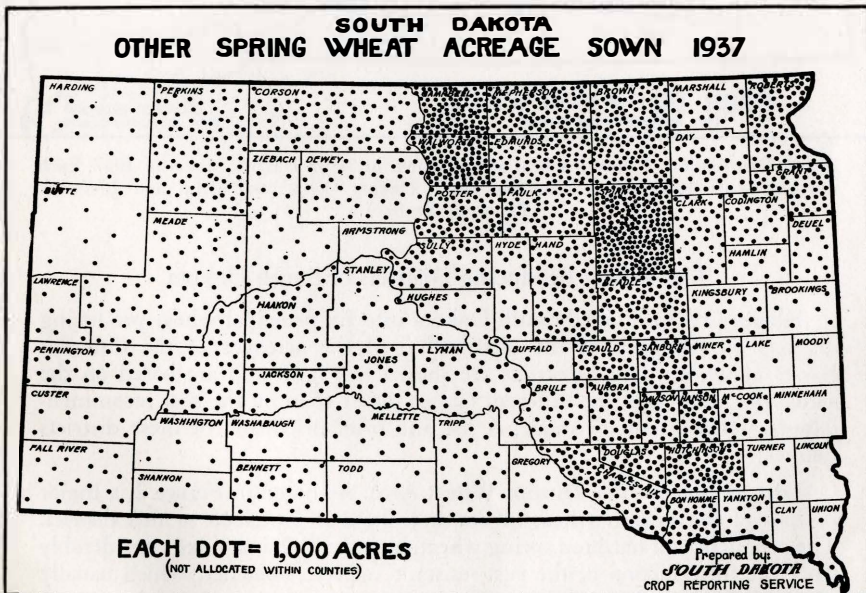


Fig. 1. Distribution of common spring wheat acreage sown in South Dakota, season of 1937. Each dot represents 1000 acres. (Courtesy South Dakota Cooperative Crop and Livestock Reporting Service).

the northeastern portion although an area of lesser concentration is found in the south central area. It should be noted, however, that both common spring and durum wheat are produced to some extent in practically every county in the state.

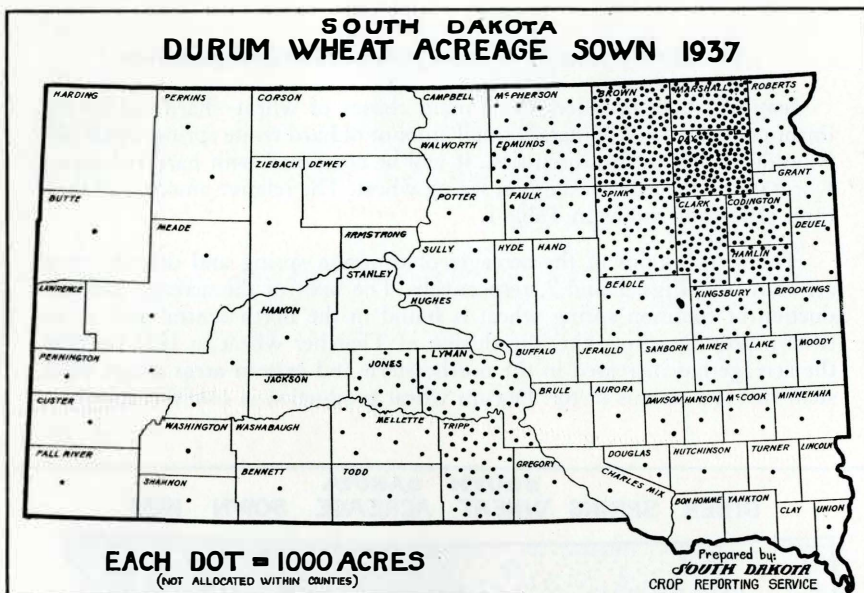


Fig. 2. Distribution of durum wheat acreage sown in South Dakota, season of 1937. Each dot represents 1000 acres. (Courtesy South Dakota Cooperative Crop and Livestock Reporting Service).

### The Wheat Producing Districts of South Dakota

Klages (1931) divided South Dakota into six principal wheat producing districts on the basis of the distribution of the acreages of the different classes of wheat. These districts are shown in Fig. 3 and are based on the actual distribution of the different classes rather than on the best recommendations which might be made. A list and brief discussion of these districts follows:

**District No. 1—The Durum Wheat Area.** As noted in Figure 2, a major portion of the durum wheat in South Dakota is produced in this district. The production of hard red spring wheat, however, has increased considerably since the introduction of the rust-resistant variety, Thatcher, which usually outyields the best durum wheat varieties.

**District No. 2—The East-Central Area.** Very little wheat is produced in this district but some increase in the hard red spring wheat acreage has

occurred during the past few years because of Thatcher and other rust-resistant varieties. Only a small amount of durum and hard red winter wheat is grown. The acreage of winter wheat has increased somewhat in the southern part of this district during the past decade but the tendency toward an increase in acreage for the district as a whole has been offset by the severe rust epidemic on winter wheat in 1937 and 1938. Winter wheat may be grown successfully in the northern part of this district if proper cultural practices such as seeding in standing corn with a one-horse drill are observed.

**District No. 3—The Northern Hard Red Spring Wheat Area.** This district produces a higher percentage of hard red spring wheat than any other district. Some durum wheat is produced, especially in the eastern end of the district. Yield trials have shown that the yields of the leading varieties of hard red spring and durum wheat are about equal.

**District No. 4—The Central Hard Red Spring Wheat Area.** Conditions in this area are similar to those in District No. 3 but the two districts were separated by Klages (1931) because of a higher percentage of durum wheat in District No. 4. Because of the marked decrease in durum wheat production in the latter district (Fig. 2), Districts 3 and 4 might be considered as one at the present time. Winter wheat is considered too uncertain a crop in this district unless more winterhardy varieties are developed.

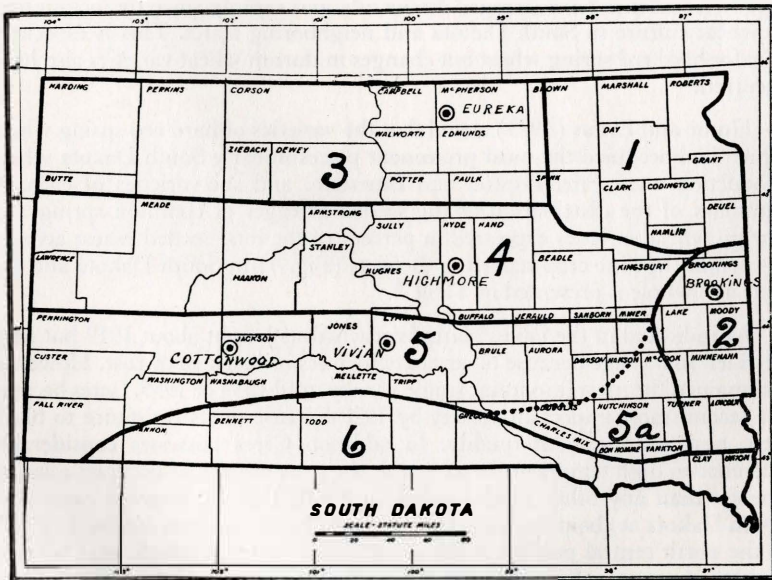


Fig. 3. Wheat producing districts of South Dakota, based on the distribution of different classes of wheat grown throughout the state. The locations of the experiment stations also are shown.

**District No. 5—The Southern Hard Red Spring Wheat Area.** This district is primarily a hard red spring wheat producing area but considerable hard white wheat of the variety Quality (Burbank) is produced in the southeastern portion, especially in Hutchinson county. A considerable amount of durum wheat is produced in the central portion, especially in Lyman and Jones counties. More winter wheat is grown in this district than in those to the north but it is still an uncertain crop except in the southeastern portion (5a) and in protected places in the central and western portions.

**District No. 6—The Hard Red Winter Wheat Area.** Hard red spring wheat is of far greater importance but it is in this district that the greatest acreage of winter wheat is found and where it can best be grown in South Dakota. The acreage of winter wheat is concentrated in the extreme eastern and extreme western portions of the district but a fairly sizable acreage also is grown in the middle portion, including Gregory and Tripp counties. Most of the acreage of durum wheat is found in Tripp county.

### **Distribution and Relative Importance of Common Spring and Durum Wheat Varieties in South Dakota**

Because of the development and distribution of new improved varieties of wheat by state and federal agricultural experiment stations, and by private breeders, varieties have changed frequently and rapidly since the beginning of wheat culture in South Dakota and neighboring states. This is especially true for hard red spring wheat but changes in durum wheat varieties also have occurred.

Hume and Evans (1923) stated that the varieties of hard red spring wheat which had occupied the most prominent places in early South Dakota wheat production were Fife, Preston and Bluestem, and sub-varieties of each. A summary of the distribution of the seeded acreages of common spring and durum wheat varieties expressed in percent of the total seeded wheat acreage in each of the nine crop reporting districts (Fig. 4) in South Dakota and the state as a whole is presented in Table 2.

As indicated in the table, Marquis reached its height about 1919 but later declined in acreage because of severe epidemics of black stem rust. However, it remained the most important single variety until 1934 or 1935. Ceres became the second most important variety by 1929 because of its resistance to black stem rust and excellent quality. In addition Ceres possesses considerable tolerance to high temperatures so that at the present time, it occupies a larger acreage than any other single variety in South Dakota. Reward came into South Dakota at about the same time as Ceres but it has been confined largely to the north central portion of the state. Other varieties which have become of temporary or minor importance are Kota, Quality (Burbank), Komar (1656), Marquillo, Marvel, and Hope (Clark and Quisenberry, 1937). In 1935, Thatcher was introduced and grown on a small scale, and largely because of its resistance to black stem rust, it has become the most important

variety in eastern South Dakota and the second most important for the state as a whole.

Several old and several undesirable varieties are still being grown to a limited extent but the estimates in Table 2 indicate that even as a group, they are of minor importance. Several new varieties made their appearance for the first time in 1939 but the acreages grown are as yet insignificant.

Among the durum wheat varieties, Pentad (Red Durum) occupies the largest acreage. Although unsuited to the making of flour, this variety has been grown because of its ability to yield in hot, dry seasons and its high degree of resistance to rust. Mindum is the leading variety of amber durum with Kubanka second among varieties of acceptable quality. Other varieties grown to a limited extent are Golden Ball, Peliss (Black-bearded) and Acme.

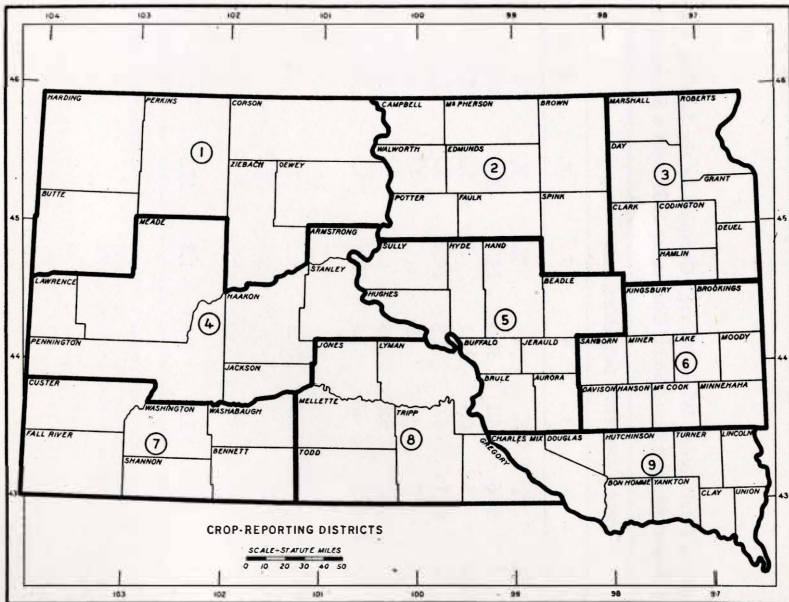


Fig. 4. The South Dakota crop reporting districts. (Courtesy South Dakota Cooperative Crop and Livestock Reporting Service).

### Results Obtained From Tests of Spring Wheat Varieties in South Dakota

Three types of tests are used in South Dakota for testing and evaluating varieties of wheat. These are (1) the rod-row nursery or preliminary yield test, (2) the 1/66 or 1/55 acre plot tests, and (3) strip tests in farmers' fields. Illustrations of these three types of tests are shown in Figs. 5, 6, and 7.

Table 2. Estimated Percentages of the Total Seeded Wheat Acreage Occupied by the Leading Varieties of Common Spring and Durum Wheat in the Nine Crop Reporting Districts of South Dakota for 1939 with a Summary for the Entire State Since 1919.<sup>1</sup>

Variety	CROP REPORTING DISTRICTS, 1939									STATE				
	1	2	3	4	5	6	7	8	9	1939	1934	1929	1924	1919
<b>Common Spring</b>	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Ceres	60.9	37.2	3.1	48.6	56.1	30.0	14.7	29.2	22.6	33.5	25.2	.4	---	---
Thatcher	6.6	32.2	46.2	.5	20.4	32.1	.3	5.9	21.9	24.5	---	---	---	---
Marquis	17.2	6.3	.2	39.7	6.0	2.8	24.5	3.7	2.7	8.4	43.0	47.1	47.1	61.2
Reward	2.7	2.7	7.0	.2	.1	.3	---	4.3	1.6	3.1	2.5	.1	---	---
Quality <sup>2</sup>	2.2	.4	---	.1	9.1	9.0	---	.5	33.1	4.3	2.6	.7	.1	---
Others	.1	.9	2.8	---	.7	1.0	12.8	1.5	3.4	1.8	1.8	7.7	5.2	15.2
<b>Durum</b>														
Pentad	3.0	10.3	25.1	---	.5	14.3	---	1.7	.8	8.6	4.4	15.4	3.7	.3
Mindum	---	.4	5.1	.1	.8	---	---	1.3	---	1.1	1.4	.1	---	---
Others (Named)	---	---	1.8	---	.8	---	---	16.2	---	1.7	7.4	4.1	5.5	.6
Others (Unnamed)	5.5	4.5	15.1	3.4	5.1	9.8	1.8	17.5	1.3	7.3	5.8	21.7	33.8	16.8

1. Adapted from data obtained through the courtesy of the South Dakota Cooperative Crop and Livestock Reporting Service and J. A. Clark, Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture.

2. White wheat also known as Burbank or Florence.

Rod-row nurseries have been grown on the experiment station at Brookings and the experiment sub-station at Highmore. The 1/66 acre plot tests have been grown at Brookings and Highmore while 1/55 acre plots have been used on the substations at Eureka and Cottonwood. Strip tests in farmers' fields are conducted by the South Dakota State College Extension Service and the Station Agronomy Department, cooperating, with the county agents in the various counties.

The rod-row nursery consists of three-row plots of each variety with rows one foot apart and 18 feet long. All of the varieties are planted side by side in a block and the block is then replicated 3 or 4 times. Since 1935 the varieties have been randomized within each block so they do not always occur in the same order. Each variety, therefore, is grown in 3 or 4 places in the test and its location in each block is determined solely by chance. Yield determinations are taken only from the middle rows of the individual plots, the two outside rows serving only to avoid competition between varieties. Shortly before harvesting, each middle row is cut down to 16 feet, one foot being cut off at each end to eliminate border effect. The rod-row nursery is used primarily for the preliminary testing of new strains and varieties. After 3 or more years of testing in the nursery, the superior strains of varieties are advanced to the 1/66 or 1/55 acre plots for further testing. The advantage of the nursery is that a large number of strains or varieties can be tested on a



Fig. 5. Hard red spring wheat nursery in the early part of the season of 1931.



small area. Klages (1933) showed that the agreement between yields in the rod-row nursery and in the 1/66 acre plots was very close over a period of years.

The 1/66 acre plots are simply 7-foot drill strips, 8 rods long, sown across an acre which is 8 x 20 rods in its dimensions. To minimize the border effect obtained from having cultivated alleys between the plots, no extra space is left between plots but the next to the end holes in the drill are stopped up leaving a 5-foot strip in the middle with a one-foot space on each side. A 5-foot binder is then used to harvest the 5-foot strip which measures 1/66 of an acre (Klages, 1931). In the case of the 1/55 acre plots, the width of the strip harvested is 6 feet. Three replicates have been used in nearly all cases. In most years, the plots have followed a cultivated crop but because of a shortage of land, this has not always been possible.

The strip tests conducted by the Extension Service and the Station Agronomy Department, cooperating, consist of one or two drill widths of each of the varieties which are grown side by side in a farmer's field, usually in comparison with the farmer's own variety. Yields are taken by harvesting from

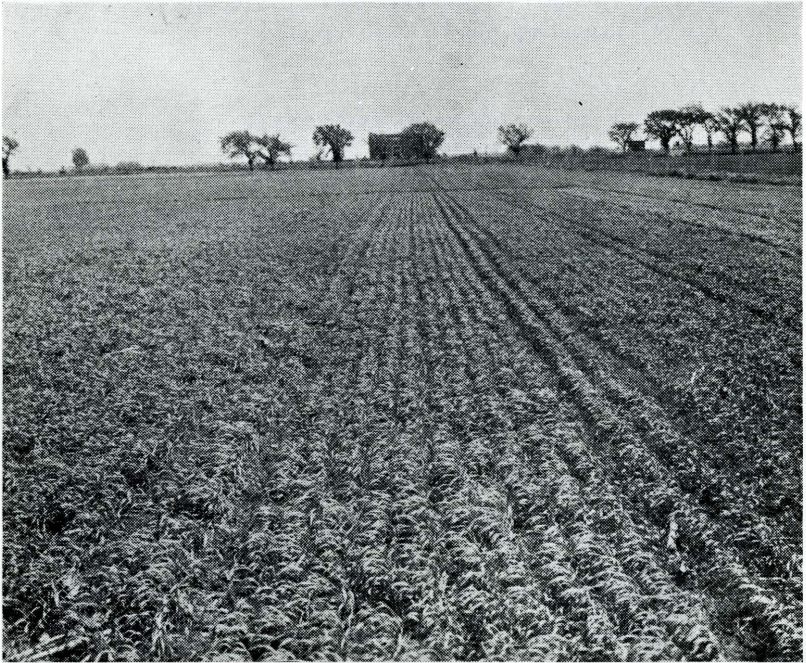


Fig. 6. A section of the spring wheat 1/66 acre plots in the early part of the season of 1940.

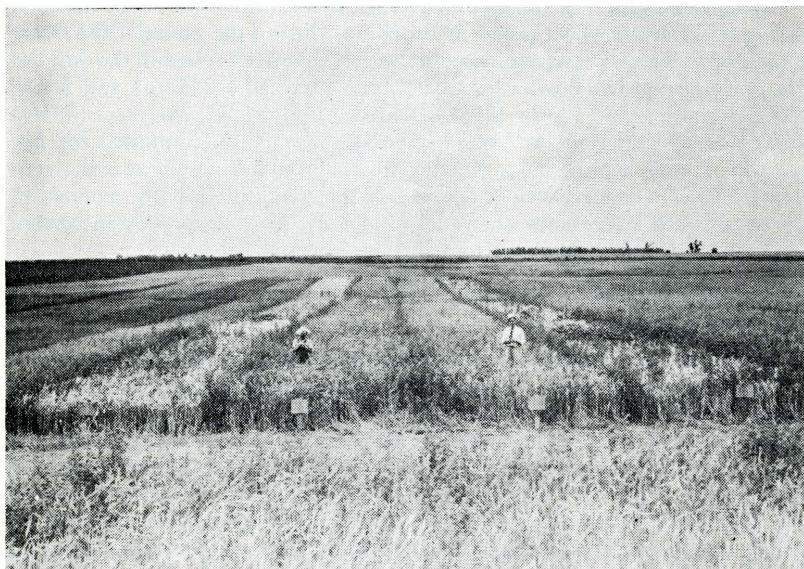


Fig. 7. General view of a cooperative strip test on a farm in McCook county in 1938.

3 to 6 square yards from each variety. The purpose of these tests is to demonstrate new or superior strains and varieties after thorough testing at the experiment stations.

Throughout the discussion of the results of the tests, except at Cottonwood, Thatcher has been used as a standard for comparison because of its importance in eastern South Dakota and its high yields at all places where tested. Mindum has been used similarly for the durum wheat comparisons.

#### **Results at Brookings**

The period 1930-39 at Brookings has been characterized by extreme seasonal variations, in climate and other factors influencing the growth and yield of wheat. Two seasons of extreme drought in 1933 and 1934 resulted in a total crop failure in 1933 and nearly a crop failure in 1934. In 1936, when practically the entire state suffered from severe drought, the yields of wheat and other small grains were fair to good in the vicinity of Brookings. Severe epidemics of black stem rust were experienced in 1935 and 1937 while a moderate epidemic occurred in 1938. Orange leaf rust was especially severe in 1938. Grasshoppers, however, occurred only in small numbers in 1936, 1937 and 1938 so little or no damage has occurred on the plots at Brookings.

The data obtained at Brookings therefore represent the performance of varieties under practically all conditions under which a wheat variety must grow in eastern South Dakota, as far as climate and diseases are concerned.

**1/66 Acre Plots.** The annual and average yields of the varieties of common spring and durum wheat tested in Brookings during the period 1930-39 are presented in Table 3. Yields of varieties which have been tested in the past but are no longer grown in the tests have been reported by Hume and Evans (1923), Hardies and Hume (1927), Klages (1931, 1934), Swenson (1936), and Swenson and Bankert (1937). Averages have been computed for five periods in order to provide for direct comparisons in bushels per acre between new varieties which have been added and the standard varieties retained in the tests. In the last column, the yields of all varieties are expressed in percent of Thatcher for the period during which each was grown.

Data on characters other than yield are presented in Table 4, averages for the five periods being given.

From the standpoint of yield, Thatcher is unquestionably superior to Ceres and Marquis, both of which have been outstanding varieties in eastern South Dakota. A major portion of the difference between Thatcher and Ceres can be accounted for by the severe epidemics of black stem rust in 1935 and 1937 and the lighter epidemics in 1938 and 1939. In years of little or no rust, the yields of Ceres are about equal to those of Thatcher. When test weights are compared, Ceres averages slightly higher than Thatcher. In years of severe rust epidemics, Thatcher has given higher test weights than Ceres but in years of lighter epidemics, Ceres has been about equal to Thatcher. When no rust occurs, Ceres is definitely superior to Thatcher in test weight.

Thatcher grows about one inch shorter than Ceres on the average and is from 2 to 3 days earlier in heading and maturity. Only one year's data are available on lodging but general observations indicate that Thatcher has a much stiffer straw than Ceres. A comparison of the percentages of rust infection shows that Thatcher possesses a fairly high degree of resistance to black stem rust as compared to Ceres. However, Thatcher is nearly as susceptible to orange leaf rust as Ceres.

Of the other varieties of common spring wheat which have been tested, only Pilot, Rival and Renown have been released and distributed to farmers in the hard red spring wheat area of the United States and Canada. Rival has been about equal to Thatcher in yield at Brookings while Pilot and Renown have yielded somewhat lower. All three of these new varieties are slightly superior to Thatcher in test weight and more resistant to orange leaf rust, Rival having the lowest leaf rust infection. Rival grows 2 or 3 inches taller than Thatcher, Pilot about the same as Thatcher and Renown slightly shorter. Renown is about as early as Thatcher but both Pilot and Rival are 2 or 3 days later. The percentages of black stem rust have been slightly higher on Pilot and Rival than on Thatcher while Renown is apparently a little more resistant than Thatcher.

The other new strains or varieties of common spring wheat, Hope x Ceres (S.D. 1463), Vesta, Merit and Premier have not been released or distributed. All appear to be about equal to Thatcher in yield and slightly more resistant to black stem rust. Both Merit and Premier are considerably more resistant to

orange leaf rust. Because of limited space, Mindum is the only variety of durum wheat which has been in the tests continuously. Yields of Kubanka, Arnautka and other durum wheat varieties tested in the past have been reported in the publications mentioned previously. Comparisons of the leading durum wheat varieties at Brookings will, however, be given from rod-row data in Tables 7 and 8. Of interest in Table 3 is the fact that the rust-resistant varieties of common spring wheat give higher average yields than the leading durum variety.

**Common Spring Wheat Rod Rows.** As pointed out previously, the rod-row nursery is used primarily for the preliminary testing of new strains and varieties. Standard varieties are included for comparison while some of the old or undesirable varieties are included to demonstrate their inferiority. Since 1932, a number of new strains developed at the South Dakota Agricultural Experiment Station have been tested. None of the new strains is yet ready for release and distribution but one, Hope x Ceres (S.D. 1463), appears to be promising and amenable to further improvement by selection. Some of the other strains have been used as parents in new crosses because they possess certain desirable characters. Several new varieties and strains developed elsewhere have also been included in the tests. However, this bulletin has been limited to those new strains and varieties which have been or are about to be released and distributed.

In Table 5, it will be noted that Thatcher is the highest yielding variety among those tested for the entire period. Ceres ranks second while Quality, Reward, Marquis and Hope are considerably below Thatcher in yield. Among the new varieties, Pilot and Mercury have yielded slightly more than Thatcher, due perhaps to the epidemic of orange leaf rust which attacked Thatcher very severely in 1938. On the basis of the tests for the one or two-year periods, the remaining new varieties do not appear to have the yielding capacity of Thatcher.

The results in Table 6 show that several of the varieties are superior to Thatcher in test weight. Only Quality, Reward and Renown are earlier in maturity, the remaining varieties being from one to five or six days later in date of heading. Thatcher grows from 1 to 3 inches shorter than most of the other varieties. Most of the new varieties, however, are relatively more resistant to black stem rust than Thatcher but some of them are almost as susceptible to orange leaf rust.

**Durum Wheat Rod Rows.** Several new strains developed by the South Dakota Agricultural Experiment Station and by the United States Department of Agriculture in cooperation with the North Dakota Experiment Station, have been tested during the period 1933-39. Some appear to have considerable promise but none will be ready for distribution for some time; consequently, these new strains are not discussed in the present bulletin.

Among the leading durum wheat varieties, Mindum has given the best performance for the six-year period indicated in Tables 7 and 8. Because of its excellent quality as well as high yields, Mindum still appears to be the

Table 3. Annual and Average Yields of the Varieties of Common Spring and Durum Wheat Grown in the 1/66 A. Plot Tests on the Experiment Station at Brookings During the Period 1930 to 1939, Inclusive.

Variety	C.I.No. <sup>1</sup>	S.D.No.	YIELD IN BUSHEL PER ACRE										9-year		6-year		4-year		3-year		2-year		Percent of Thatcher during yrs. grown
			1930	1931	1932	1933 <sup>2</sup>	1934	1935	1936	1937	1938	1939	av. 1930-39	av. 1934-39	av. 1936-39	av. 1937-39	av. 1938-39	av. 1938-39	av. 1938-39				
Thatcher	10003	1409	21.3	12.3	19.3		4.4	26.0	29.0	21.1	26.3	30.9	21.2	23.0	26.8	26.1	28.6	100					
Ceres	6900	1281	21.2	12.0	23.0		4.8	6.5	21.5	10.0	20.3	31.5	16.8	15.8	20.8	20.6	25.9	79					
Marquis	3641	515	16.3	11.5	21.0		4.0	5.3	17.5	4.9	16.5	22.3	13.3	11.8	15.3	14.6	19.4	63					
Pilot	11428	1466					5.2	21.8	22.1	20.3	25.6	31.9		21.2	25.0	25.9	28.8	92					
Rival	11708	1467							23.8	20.5	32.0	32.2			27.1	28.2	32.1	101					
Renown <sup>3</sup>	11709	1468								17.5	25.0	28.1				23.5	26.6	90					
Hope x Ceres	11897	1463									25.6	30.3					28.0	98					
Vesta	11712	1469									26.1	29.2					27.7	97					
Merit	11870	1470										31.3						101					
Premier	11940	1471										30.2						98					
Mindum	5296	1160	22.0	14.7	17.3		4.8	17.3	18.4	11.6	28.1	26.4	17.8	17.8	21.1	22.0	27.3	84					

1. Cereal Investigation Number assigned by the Division of Cereal Investigations, Bureau of Plant Industry, United States Department of Agriculture.

2. Crop failure due to drought.

3. New Renown (C.I. 11947, S.D. 1472) in 1939.

Table 4. Summary of Data on Characters Other Than Yield of the Varieties of Common Spring and Durum Wheat Grown in the 1/66 A. Plot Tests on the Experiment Station at Brookings During the Period 1930 to 1939, Inclusive.

Variety	C.I.No.	S.D.No.	WEIGHT POUNDS PER BUSHEL <sup>2</sup>					HEIGHT OF PLANT IN INCHES <sup>3</sup>						
			8-yr. av. 1930-39	5-yr. av. 1935-39	4-yr. av. 1936-39	3-yr. av. 1937-39	2-yr. av. 1938-39	1939	9-yr. av. 1930-39	6-yr. av. 1934-39	4-yr. av. 1936-39	3-yr. av. 37-39	2-yr. av. 38-39	1939
Thatcher	10003	1409	52.1	54.2	54.0	54.3	55.0	58.7	33	33	35	34	32	29
Ceres	6900	1281	54.5	51.6	53.3	53.3	56.0	60.3	34	34	35	34	31	30
Marquis	3641	515	50.9	47.1	48.9	48.9	52.8	57.2	35	33	35	34	32	33
Pilot	11428	1466		53.6	54.3	55.1	55.6	57.2		34	37	34	32	32
Rival	11708	1467			56.0	57.3	58.0	59.7			38	37	35	33
Renown <sup>1</sup>	11709	1468				57.7	58.6	60.5				33	31	29
Hope x Ceres	11897	1463					56.8	59.5					34	32
Vesta	11712	1469						59.0						32
Merit	11870	1470						58.3						31
Premier	11940	1471						61.0						32
Mindum	5296	1160	58.0	55.9	56.9	58.2	61.3	62.0	39	40	42	41	39	36

Continued on next page.

Table 4, (continued).

Variety	DATE OF HEADING <sup>3</sup>					DATE OF RIPENING <sup>3</sup>						
	9-yr. av. 1930-39	6-yr. av. 1934-39	4-yr. av. 1936-39	3-yr. av. 1937-39	2-yr. av. 1938-39	1939	9-yr. av. 1930-39	6-yr. av. 1934-39	4-yr. av. 1936-39	3-yr. av. 1937-39	2-yr. av. 1938-39	1939
Thatcher	6-22	6-22	6-20	6-19	6-15	6-10	7-19	7-19	7-18	7-19	7-16	7-14
Ceres	6-25	6-25	6-22	6-22	6-17	6-13	7-20	7-20	7-20	7-21	7-17	7-17
Marquis	6-25	6-25	6-24	6-23	6-18	6-14	7-20	7-20	7-20	7-21	7-28	7-18
Pilot		6-24	6-23	6-22	6-18	6-13		7-21	7-21	7-22	7-19	7-18
Rival			6-22	6-22	6-17	6-12			7-21	7-23	7-20	7-17
Renown				6-20	6-15	6-10				7-19	7-16	7-14
Hope x Ceres					6-18	6-13					7-17	7-15
Vesta						6-11						7-14
Merit						6-12						7-14
Premier						6-10						7-15
Mindum	6-26	6-26	6-24	6-23	6-17	6-13	7-23	7-23	7-23	7-24	7-21	7-19

Variety	LODGING 1938		PERCENT BLACK STEM RUST <sup>4</sup>					PERCENT ORANGE LEAF RUST <sup>5</sup>				1939	
	Percent	Degree	8-yr. av. 1930-39	5-yr. av. 1935-39	4-yr. av. 1936-39	3-yr. av. 1937-39	2-yr. av. 1938-39	1939	6-yr. av. 1930-39	4-yr. av. 1935-39	3-yr. av. 1937-39		2-yr. av. 1938-39
Thatcher	23	10	2	3	3	4	4	1	40	58	70	80	75
Ceres	17	34	30	46	38	48	40	25	43	62	73	85	80
Marquis	25	15	48	64	60	75	65	50	45	63	77	90	90
Pilot	40	38		9	9	12	3	Trace			22	18	25
Rival	37	39			9	12	8	1			7	8	10
Renown	13	30				1	1	Trace			38	33	40
Hope x Ceres	30	30					1	Trace				15	20
Vesta	47	36						Trace					60
Merit								Trace					3
Premier								Trace					2
Mindum	40	58	23	34	33	43	25	Trace	2	3	2	Trace	0

1. New Renown (G.I. 11947, S.D. 1472) in 1939.

2. No data in 1933 (crop failure) and 1934 (not determined).

3. No data in 1933 (crop failure).

4. No data in 1933 (crop failure) and 1934 (no rust).

5. No data in 1933 (crop failure) and 1932, 1934, or 1936 (no rust or not determined).

Table 5. Annual and Average Yields of the Varieties of Common Spring Wheat Grown in the Rod-row Nursery in the Experiment Station at Brookings During the Period 1932 to 1939, Inclusive.

Variety	C.I.No.	S.D.No.	1932	YIELD IN BUSHEL PER ACRE							7-yr. av. 1932-39	5-yr. av. <sup>1</sup> 1932-39	2-yr. av. 1938-39	Percent of Thatcher during yrs. grown
				1933 <sup>2</sup>	1934	1935	1936	1937	1938	1939				
Thatcher	10003	1409	20.4				14.1	22.6	19.7	29.6		21.3	24.7	100
Ceres	6900	1281	20.7	5.5	10.8	11.2	12.9	22.0	27.9		15.9	18.9	25.0	89
Hope x Ceres	11897	1463	15.3	2.9	27.0	11.3	20.5	24.5	20.5		17.4	18.4	22.5	87
Quality	6607	1261	17.1	0.7	10.0	17.2	12.9	20.5	23.0		14.5	18.1	21.8	85
Reward	8182	1291	19.1	0.5	18.0	15.4	17.0	13.4	17.9		14.5	16.6	15.7	78
Marquis	3641	515	18.1	4.2	8.1	8.5	7.6	13.6	24.1		12.0	14.4	18.9	68
Hope	8178	1311	10.9			6.4	12.5	15.2	25.1			14.0	20.2	66
Pilot-B	11428	1466						25.6	26.7				26.2	106
Mercury	11872							27.6	24.4				26.0	105
Vesta	11712	1469						20.4	27.5				24.0	97
Renown	11709	1468						18.0	23.8				20.9	85
Nordhaugen	11801							17.8	24.0				20.9	85
Apex	11636							17.0	17.5				17.3	70
Merit	11870	1470							26.4					89
Coronation	11475								24.7					83
Premier	11940	1471							24.1					81
Marquillo	6887	1308	17.0						23.8					80
New Renown	11947	1472							23.3					79
Rival	11708	1467							22.7					77
Great Northern	11937								21.2					72
Newmarq	12028								20.5					69

1. Excluding 1934 and 1935 when Thatcher and Hope were not grown.

2. Crop failure due to drought.

Table 6. Summary of Data on Characters Other Than Yield of the Varieties of Common Spring Wheat Grown in the Rod-row Nursery on The Experiment Station at Brookings During the Period 1932 to 1939, Inclusive.

Variety	C.I.No.	S.D.No.	WEIGHT POUNDS PER BUSHEL <sup>2</sup>			DATE OF HEADING <sup>3</sup>				DATE OF RIPENING <sup>3</sup>			
			5-Yr. av. 1932-39	2-yr. av. 1938-39	1939	7-yr. av. 1932-39	5-yr. av. 1932-39	2-yr. av. 1938-39	1939	7-yr. av. 1932-39	5-yr. av. 1932-39	2-yr. av. 1938-39	1939
Thatcher <sup>1</sup>	10003	1409	53.3	58.0	60.0		6-16	6-12	6-7		7-15	7-13	7-11
Ceres	6900	1281	53.9	58.3	58.5	6-19	6-18	6-14	6-9	7-17	7-16	7-15	7-13
Hope x Ceres	11897	1463	54.9	59.5	60.0	6-19	6-18	6-13	6-8	7-17	7-17	7-15	7-13
Quality	6607	1261	54.1	59.0	60.0	6-13	6-12	6-7	6-1	7-14	7-13	7-10	7-8
Reward	8182	1291	55.8	56.0	55.0	6-13	6-13	6-8	6-3	7-15	7-13	7-10	7-8
Marquis	3641	515	49.9	55.3	58.5	6-21	6-20	6-16	6-12	7-18	7-18	7-15	7-13
Hope <sup>2</sup>	8178	1311	50.6	56.5	58.0		6-20	6-15	6-12		7-17	7-15	7-13
Pilot-B	11428	1466		58.8	59.5			6-14	6-10			7-14	7-12
Mercury	11872			59.5	60.0			6-14	6-9			7-15	7-12
Vesta	11712	1469		59.3	61.5			6-13	6-8			7-14	7-12
Renown	11709	1468		57.5	60.0			6-11	6-7			7-13	7-11
Nordhaugen	11801			57.5	59.0			6-13	6-8			7-13	7-11
Apex	11636			56.3	59.5			6-16	6-13			7-15	7-13
Merit	11870	1470			59.5				6-8				7-13
Coronation	11475				58.0				6-13				7-13
Premier	11940	1471			61.5				6-8				7-14
Marquillo	6887	1308			59.0				6-9				7-13
New Renown	11947				60.5				6-7				7-7
Rival	11708				60.0				6-10				7-13
Great Northern	11937				58.0				6-7				7-13
Newmarq	12028				57.0				6-9				7-13

Continued on next page.



Table 6. (Continued)

Variety	HEIGHT PLANTS IN INCHES <sup>3</sup>				PERCENT BLACK STEM RUST <sup>4</sup>				PERCENT ORANGE LEAF RUST <sup>5</sup>			
	7-yr. av. 1932-39	5-yr. av. 1932-39	2-yr. av. 1938-39	1939	5-yr. av. 1932-39	4-yr. av. 1932-39	2-yr. av. 1938-39	1939	4-yr. av. 1935-39	3-yr. av. 1937-39	2-yr. av. 1938-39	1939
Thatcher <sup>1</sup>		31	29	24		4	4	5		47	58	85
Ceres	32	32	30	27	40	32	26	15	40	45	38	50
Hope x Ceres	32	32	31	25	Trace	Trace	Trace	0	11	9	5	5
Quality	30	31	29	23	57	49	46	25	57	66	70	90
Reward	31	32	27	21	49	41	54	50	51	60	65	100
Marquis	32	32	31	29	55	49	54	50	46	54	55	90
Hope <sup>1</sup>		31	30	28			Trace	0		3	3	5
Pilot-B			32	28			1	Trace			18	25
Mercury			32	27			Trace	0			1	2
Vesta			32	28			1	Trace			43	65
Renown			30	25			3	Trace			39	75
Nordhaugen			31	26			2	1			80	100
Apex			30	25			4	Trace			23	40
Merit				25				Trace				15
Coronation				27				0				1
Premier				27				0				5
Marquillo				26				2				60
New Renown				25				0				50
Rival				28				Trace				20
Great Northern				29				0				15
Newmarq				28				0				15

1. Not grown in 1934 and 1935.

2. No data in 1933 (crop failure) and 1934 or 1935 (not determined).

3. No data in 1933 (crop failure).

4. No data in 1933 (crop failure) and 1934 or 1936 (no rust).

5. No data in 1936 (no rust).

Table 7. Annual and Average Yields of the Varieties of Durum Wheat Grown in the Rod-row Nursery on The Experiment Station at Brookings During the Period 1933 to 1939, Inclusive.

Variety	C.I.No.	S.D.No.	YIELD IN BUSHELS PER ACRE							6-year av. 1933-1939	5-year av. 1935-1939	2-year av. 1938-39	Percent of Mindum during yrs. grown
			1933	1934 <sup>1</sup>	1935	1936	1937	1938	1939				
Mindum	5296	1160	4.2		19.0	6.6	14.1	31.5	19.6	15.8	18.2	25.6	100
Arnautka	4064	1001	7.7		16.8	3.9	13.9	28.8	18.7	15.0	16.4	23.8	95
Kubanka	1440	75	5.9		11.7	2.8	11.5	28.4	19.6	13.3	14.8	24.0	84
Pentad	3332	1414			20.8	6.8	17.3	21.8	21.5		17.6	21.7	97
Acme	5284	284						29.6	23.3			26.5	104

1. Crop failure due to drought.

Table 8. Summary of Data on Characters Other Than Yield of the Varieties of Durum Wheat Grown in the Rod-row Nursery on The Experiment Station at Brookings During the Period 1933 to 1939, Inclusive.

Variety	C.I.No.	S.D.No.	Wght. pounds per bushel <sup>1</sup>		Ht. Plants in inches <sup>1</sup>		DATE OF HEADING <sup>2</sup>			DATE OF RIPENING <sup>2</sup>			LODGING 1938		PERCENT BLACK STEM RUST <sup>3</sup>		PERCENT ORANGE LEAF RUST <sup>4</sup>	
			4-year av. 1936-39	2-year av. 1938-39	4-year av. 1936-39	2-year av. 1938-39	5-year av. 1935-39	2-year av. 1938-39	5-year av. 1935-39	2-year av. 1938-39	Per- cent	De- gree	4-year av. 1935-39	2-year av. 1938-39	3-year av. 1937-39	2-year av. 38-39		
Mindum	5296	1160	56.6	61.9	35	34	6-21	6-14	7-20	7-17	12	18	17	1	2	Trace		
Arnautka	4064	1001	54.1	60.3	34	34	6-20	6-13	7-20	7-17	37	28	21	1	12	1		
Kubanka	1440	75	55.8	61.0	34	35	6-23	6-16	7-21	7-17	30	16	20	3	3	Trace		
Pentad	3332	1414	56.5	60.0	33	32	6-20	6-15	7-20	7-17	60	54	5	Trace	2	Trace		
Acme	5284	284		60.3		32		6-14		7-17	45	26		Trace		Trace		

1. No data in 1934 (crop failure) and 1933 or 1935 (not determined).

2. No data in 1934 (crop failure) and 1933 (not determined).

3. No data in 1934 (crop failure) and 1933 or 1936 (no rust).

4. No data before 1936.

most desirable variety of durum wheat in eastern South Dakota. Kubanka and Arnautka, both acceptable varieties from the standpoint of quality, have not yielded as well as Mindum at Brookings. Furthermore, pure seed of these varieties is usually difficult to obtain.

Pentad, which is the common variety of red durum grown in South Dakota has yielded only slightly less than Mindum. However, it is considerably more resistant to black stem rust. Since red durum is not acceptable for the manufacture of durum wheat flour for seminola products, the demand is limited to the production of feeds in which wheat is used. Acme, a selection from Kubanka, is inferior to Mindum, Kubanka, and Arnautka in market quality, but somewhat superior in resistance to black stem rust.

Several other durum wheat varieties were tested at Brookings previous to 1933, the yields having been reported by Klages (1931).

### **Results At Highmore**

Seasonal variations are usually more pronounced at Highmore than at Brookings and the period 1932-39 was no exception. Complete failures were experienced in 1933, 1934, and 1936 because of drought and the crop in 1937 was almost a complete failure because of grasshoppers and drought. A severe grasshopper infestation occurred in 1938 but it was possible to harvest the 1/66 acre plots of wheat before any severe damage was done. The rod rows, on the other hand, were damaged considerably by the grasshoppers before they were ripe enough to harvest. No severe rust epidemics occurred during the period but moderately severe infections occurred on susceptible varieties in 1935, 1937, and 1938. The importance of developing varieties more tolerant of high temperatures and drought and more resistant to grasshoppers, is emphasized by the results at Highmore.

**One sixty-sixth Acre Plots.** The yields from the 1/66 acre plots at Highmore for the period 1932-39 are presented in Tables 9 and 10. Of the four standard varieties, Thatcher has given the highest average yields with Ceres, Reward, and Marquis following in the order named. The difference between Thatcher and Ceres is not as marked, however, as at Brookings and probably is not significant. Reward also has given good yields, largely because of its early maturity. Ceres and Reward have been decidedly superior in test weight while Marquis has been slightly inferior. Only Reward is earlier in maturity than Thatcher.

In comparison with Thatcher, Pilot has given about the same performance at Highmore as at Brookings with an average yield of 10 percent less than Thatcher. The performance of Rival has been about the same as that of Pilot at Highmore. Both Pilot and Rival are as late or later than Ceres in date of heading and therefore have not escaped the hot dry winds of early July as well as Thatcher and other earlier varieties. Furthermore, they probably are not quite as tolerant of high temperatures as Ceres although they are perhaps slightly superior to Thatcher in this respect. Renown has been decidedly inferior to Thatcher in yield in spite of the fact that it is almost as early in maturity.

Table 9. Annual and Average Yields of the Varieties of Common Spring and Durum Wheat Grown in the 1/66 A Plot Tests on The Experiment Substation at Highmore During the Period 1932 to 1939, Inclusive.

Variety	C.I. No.	S.D.No.	YIELD IN BUSHELS PER ACRE							5-year	3-year	2-year	Percent of Thatcher During yrs. grown
			1932	1933 <sup>1</sup>	1934 <sup>1</sup>	1935	1936 <sup>1</sup>	1937	1938	av.	av.	av.	
Thatcher	10003	1409	11.1			16.8	5.4	16.0	20.1	13.9	13.8	18.1	100
Ceres	6900	1281	10.4			13.7	7.4	14.3	21.8	13.5	14.5	18.1	97
Reward	8182	1291	11.8			16.8	5.3	10.7	21.1	13.1	12.4	15.9	95
Marquis	3641	515	5.3			12.5	3.9	8.4	15.2	9.1	9.2	11.8	65
Rival	11708	1467					6.4	14.4	17.9		12.9	16.2	93
Pilot	11428	1466					6.1	11.9	19.3		12.4	15.6	90
Renown <sup>2</sup>	11709	1468						10.7	18.1			14.4	80
Merit	11870	1470							20.3				101
Vesta	11712	1469							19.6				98
Premier	11940	1471							19.5				97
Hope x Ceres	11897	1463							19.2				96
Mindum	5296	1160	11.2			13.0	5.3	9.4	19.7				84

<sup>1</sup>. Crop failure due to drought.

<sup>2</sup>. New Renown (C.I. 11947, S.D. 1472) in 1939.

Table 10. Summary of Data on Characters Other Than Yield of the Varieties of Common Spring and Durum Wheat Grown in the 1/66 A Plot Tests on The Experiment Substation at Highmore During the Period 1932 to 1939, Inclusive.

Variety	C.I.No.	S.D.No.	WEIGHT POUNDS PER BUSHEL <sup>2</sup>				DATE OF HEADING <sup>2</sup>				DATE OF RIPENING <sup>1</sup>		
			5-yr. av. 1932-39	3-yr. av. 1937-39	2-yr. av. 1938-39	1939	5-yr. av. 1932-39	3-yr. av. 1937-39	2-yr. av. 1938-39	1939	4-yr. av. 1932-39	3-yr. av. 1937-39	1939
Thatcher	10003	1409	49.5	49.0	52.5	51.0	6-18	6-16	6-13	6-8	7-13	7-12	7-13
Ceres	6900	1281	52.4	51.1	54.5	54.0	6-21	6-19	6-17	6-14	7-13	7-12	7-13
Reward	8182	1291	53.1	52.2	57.0	56.0	6-15	6-13	6-10	6-4	7-12	7-11	7-13
Marquis	3641	515	49.2	47.7	51.5	52.0	6-22	6-20	6-18	6-16	7-13	7-12	7-13
Rival	11708	1467		50.8	53.5	52.0		6-20	6-18	6-16		7-12	7-13
Pilot	11428	1466		50.4	54.0	52.0		6-21	6-18	6-16		7-12	7-13
Renown <sup>1</sup>	11709	1468			53.5	51.0			6-14	6-10			7-13
Merit	11870	1470				52.0				6-13			7-13
Vesta	11712	1469				53.0				6-12			7-13
Premier	11940	1471				55.0				6-12			7-13
Hope x Ceres	11897	1463				52.0				6-12			7-13
Mindum	5296	1160	53.3	54.6	57.0	55.0	6-20	6-17	6-14	6-9	7-14	7-13	7-13

Continued on next page.

Table 10 (Continued)

Variety	HEIGHT PLANTS <sup>3</sup> in inches		PERCENT BLACK STEM RUST <sup>4</sup>			PERCENT ORANGE LEAF RUST	
	3-yr. av. 1932-1937	1937	4-yr. av. 1935-1939	3-yr. av. 1937-1939	2-yr. av. 1938-1939	1939	1937
Thatcher	32	35	Trace	Trace	Trace	0	10
Ceres	33	39	13	19	14	0	Trace
Reward	32	33	9	13	8	0	Trace
Marquis	29	31	22	31	19	Trace	10
Rival		34		1	Trace	0	Trace
Pilot		34		Trace	Trace	0	Trace
Renown <sup>1</sup>					Trace	0	
Merit						0	
Vesta						0	
Premier						0	
Hope x Ceres						0	
Mindum	35	38	1	1	1	0	0

1. New Renown (C.I. 11947, S.D. 1472) in 1939.

2. No data in 1933, 1934, or 1936 (crop failure).

3. No data in 1933, 1934, or 1936 (crop failure) and 1938 and 1939 (not determined).

4. No data in 1933, 1934, or 1936 (crop failure) and 1938 (not determined).

Among the remaining varieties of common spring wheat, all show promise of being about equal to Thatcher in yield on the basis of the one year's results in 1939. As indicated at Brookings, all are somewhat superior to Thatcher in test weight and resistance to black stem rust while Merit, Premier, and Hope x Ceres (1463) are also more resistant to orange leaf rust.

As at Brookings, Mindum is the only variety of durum wheat which has been tested continuously. The comparative yields of Mindum and other durum wheat varieties at Highmore have been reported previously by Klages (1931) and Hardies and Hume (1927). Further comparative yields of durum wheat varieties are presented from rod-row data in Tables 13 and 14.

**Common Spring Wheat Rod Rows.** The data from the common spring wheat rod-row nursery at Highmore are presented in Tables 11 and 12 for the period 1932-39.

Among the standard varieties, Thatcher and Ceres are the highest yielding varieties. Of the newer varieties, the most promising appear to be Pilot, Merit and Rival but data for only one or two years are not sufficient to serve as a basis for any very definite conclusions.

Thatcher has been surpassed in test weight by a number of the other varieties by about the same amounts as at Brookings. Only two varieties, Quality and Reward, are appreciably earlier than Thatcher and of the more promising new varieties, only Merit headed as early as Thatcher. Reactions to stem rust are similar to what they were at Brookings and in the 1/66 acre plots at Highmore.

Of further interest are the differences in grasshopper damage among the varieties in 1938. Ceres suffered the least damage while Marquis was damaged the most among the varieties given in Table 12.

**Table 11. Annual and Average Yields of the Varieties of Common Spring Wheat Grown in the Rod-Row Nursery on The Experiment Substation at Highmore During the Period 1932 to 1939, Inclusive.**

Variety	C.I.No.	S.D.No.	YIELD IN BUSHELS PER ACRE							Percent of Thatcher during yrs. grown					
			1932	1933 <sup>2</sup>	1934 <sup>2</sup>	1935	1936 <sup>2</sup>	1937	1938	1939	5-yr. av. 1932-39	4-yr. av. 1932-39 <sup>1</sup>	4-yr. av. 1935-39	2-yr. av. 1938-39	
Thatcher	10003	1409	6.8					4.7	5.9	17.3				11.6	<b>100</b>
Ceres	6900	1281	6.4		15.2		2.8	6.7	18.0		9.8	8.5	10.7	12.4	<b>98</b>
Quality	6607	1261	7.6		15.9		3.8	3.6	16.4		9.5	7.9	9.9	10.0	<b>90</b>
Reward	8182	1291	6.1		14.9		3.3	1.6	8.6		6.9	4.9	7.1	5.1	<b>56</b>
Marquis	3641	515	4.6		10.0		1.4	1.9	11.5		5.9	4.9	6.2	6.7	<b>56</b>
Hope	8178	1311	2.5					1.3	4.0	14.4		5.6		9.2	<b>64</b>
Hope x Ceres	11897	1463			14.1		3.8	5.5	16.3				9.9	10.9	<b>91</b>
Pilot	11428	1466						5.0	18.2					11.6	<b>100</b>
Nordhaugen	11801							1.4	16.4					8.9	<b>77</b>
Merit	11870	1470							19.2						<b>111</b>
Rival	11708	1467							18.2						<b>105</b>
Mercury	11872								15.9						<b>92</b>
Premier	11940	1471							14.8						<b>86</b>
Vesta	11712	1469							13.3						<b>77</b>
Coronation	11475								12.8						<b>74</b>
Renown	11709	1468							12.3						<b>71</b>
New Renown	11947	1472							11.4						<b>66</b>

1. Excluding 1935 when Thatcher and Hope were not grown.

2. Crop failure due to drought.

Table 12. Summary of Data on Characters Other Than Yield of the Varieties of Common Spring Wheat Grown in the Rod-row Nursery on The Experiment Substation at Highmore During the Period 1932 to 1939, Inclusive.

Variety	C.I.No.	S.D.No.	WEIGHT POUNDS PER BUSHEL <sup>2</sup>				DATE OF HEADING <sup>3</sup>			HEIGHT OF plants <sup>4</sup> in inches		Percent black <sup>5</sup> stem rust		Percent grasshop. damage
			4-yr. av. 1932-39	3-yr. av. 1937-39	2-yr. av. 1938-39	1939	3-yr. av. 1932-39	2-yr. av. 1937-39	1939	2-yr. av. 1932-37	1937	2-yr. av. 1935-37	1937	
Thatcher <sup>1</sup>	10003	1409	44.9	47.2	52.3	49.5	6-17	6-18	6-9	34	36		0	45
Ceres	6900	1281	47.1	49.2	53.8	52.5	6-20	6-19	6-11	34	37	13	10	37
Quality	6607	1261	47.1	48.2	55.3	53.5	6-13	6-13	6-3	34	37	20	25	62
Reward	8182	1291	47.3	49.0	52.5	49.0	6-14	6-14	6-4	32	34	20	25	62
Marquis	3641	515	45.4	47.2	50.8	49.5	6-21	6-21	6-13	31	34	28	35	73
Hope <sup>1</sup>	8178	1311		45.5	49.3	47.5	6-21	6-21	6-12	32	33		Trace	50
Hope x Ceres	11897	1463		48.2	53.8	51.5		6-19	6-10		37	Trace	Trace	40
Pilot	11428	1466			55.8	52.5			6-12					52
Nordhaugen	11801				50.8	49.5			6-10					53
Merit	11870	1470				49.0			6-9					
Rival	11708	1467				52.0			6-11					
Mercury	11872					49.5			6-11					
Premier	11940	1471				49.0			6-10					
Vesta	11712	1469				50.0			6-11					
Coronation	11475					48.5			6-12					
Renown	11709	1468				51.0			6-8					
New Renown	11947	1472				48.5			6-9					

1. Not grown in 1935. No test weight taken for Hope in 1932.

2. No data in 1933, 1934, or 1936 (crop failure) and 1935 (not determined).

3. No data in 1933, 1934, or 1936 (crop failure) and 1935 or 1938 (not determined).

4. No data in years other than 1932 and 1937.

5. No data in years other than 1935 and 1937.

**Durum Wheat Rod Rows.** Of the three leading varieties of amber durum wheat, Arnautka and Mindum have been superior to Kubanka in yield from 1935 to 1939 as shown in Table 13. For two years, 1938 and 1939, Acme and Pentad have given the highest yields but are not recommended because of inferior market quality. The data in Table 14 indicate that the varieties are all very similar in respect to other agronomic characters.

**Table 13. Annual and Average Yields of the Varieties of Durum Wheat Grown in the Rod-row Nursery on The Experiment Substation at Highmore During the Period 1935 to 1939, Inclusive.**

Variety	C.I.No.	S.D.No.	YIELD IN BUSHEL PER ACRE						Percent of Min- dum during	
			1935	1936 <sup>1</sup>	1937	1938	1939	4-yr. av. 1935-39	2-yr. av. 1938-39	yrs. grown
Arnautka	4064	1001	17.0		2.2	3.8	20.9	11.0	12.4	<b>105</b>
Mindum	5296	1160	14.0		2.1	8.9	17.0	10.5	13.0	<b>100</b>
Kubanka	1440	75	15.4		2.2	4.1	15.3	9.3	9.7	<b>88</b>
Acme	5284	284				9.5	19.7		14.6	<b>113</b>
Pentad	3332	1414				7.6	18.5		13.1	<b>101</b>
Golden Ball	6227	1187					17.1			<b>101</b>

1. Crop failure due to drought.

**Table 14. Summary of Data on Characters Other Than Yield of the Varieties of Durum Wheat Grown in the Rod-row Nursery on The Experiment Substation at Highmore During the Period 1935 to 1939, Inclusive.**

Variety	C.I.No.	S.D.No.	Weight pounds per bushel <sup>1</sup>		1939	Height plants in inches	Date of Heading <sup>2</sup>	Percent black stem rust	
			3-year 1937-39	2-year av. 1938-39					
Arnautka	4064	1001	52.7	58.0	54.0	46	6-19	6-10	7
Mindum	5296	1160	53.3	59.5	56.0	46	6-19	6-10	1
Kubanka	1440	75	53.8	58.3	54.5	44	6-20	6-12	3
Acme	5284	284		57.8	54.5				6-11
Pentad		1414		58.8	56.5				6-12
Golden Ball	6227	1187			56.0				6-11

1. No data in 1936 (crop failure) and 1935 (not determined).

2. No data in 1936 (crop failure) and 1935 or 1938 (not determined).

### Results At Eureka

Variations between seasons at Eureka have been similar to those at Highmore although somewhat more pronounced. Crop failures occurred because of drought in 1933, 1934 and 1936, and because of both drought and grasshoppers in 1937 and 1938. Small crops might have been harvested in the last two years mentioned, had it not been for severe grasshopper infestations.

Only 1/55 acre plot tests have been conducted at Eureka. The data on yields in Table 15 show that Thatcher again has been the highest yielding variety of the four standard varieties. Among the newer varieties, Pilot and Merit gave the highest yields for the one year, 1939.

From the data in Table 16, it may be seen that Thatcher is lower in test weight than all the other varieties except Marquis. Only Reward and New Renown headed earlier than Thatcher, the remaining varieties heading from



Table 15. Annual and Average Yields of the Varieties of Common Spring and Durum Wheat Grown in the 1/50 A. Plot Tests on The Experiment Substation at Eureka During the Period 1932 to 1939, Inclusive.

Variety	C.I.No.	S.D.No.	1932	1933 <sup>1</sup>	YIELD IN BUSHELS PER ACRE			1937 <sup>2</sup>	1938 <sup>2</sup>	1939	3-yr. av. 1932-39	Percent of Thatcher during yrs. grown
					1934 <sup>1</sup>	1935	1936 <sup>1</sup>					
Thatcher	10003	1409	32.8			19.7				11.3	21.3	100
Ceres	6900	1281	32.5			16.1				10.9	19.8	93
Reward	8182	1291	33.0			18.1				7.9	19.7	92
Marquis	3641	515	28.9			9.7				7.1	15.2	72
Pilot	11428	1466								11.3		100
Merit	11870	1470								10.9		96
Premier	11940	1471								10.4		92
Rival	11708	1467								10.4		92
New Renown	11947	1472								10.0		89
Mindum	5296	1160	28.3			18.6				8.4	18.4	87

1. Crop failure due to drought.

2. Crop failure due to drought and grasshoppers.

Table 16. Summary of Data on Characters Other Than Yield of the Varieties of Common Spring and Durum Wheat Grown in the 1/50 A. Plot Tests on The Experiment Substation at Eureka During the Period 1932 to 1939, Inclusive.

Variety	C.I.No.	S.D.No.	Weight Pounds per Bushel <sup>1</sup>		Date of Heading <sup>1</sup>		Date of Maturity <sup>1</sup>		Height in Inches <sup>1</sup>		Percent Stem Rust <sup>1</sup>	
			3-yr. av. 1932-1939	1939	3-yr. av. 1932-1939	1939	3-yr. av. 1932-1939	1939	3-yr. av. 1932-1939	1939	3-yr. av. 1932-1939	1939
Thatcher	10003	1409	56.2	55.5	6-22	6-12	7-20	7-18	32	25	1	Tr
Ceres	6900	1281	57.0	56.0	6-25	6-16	7-21	7-17	33	25	12	5
Reward	8182	1291	59.8	58.5	6-18	6-11	7-18	7-16	32	24	29	43
Marquis	3641	515	52.7	54.0	6-26	6-18	7-22	7-19	32	26	27	30
Pilot	11428	1466		56.5		6-15		7-18		27		10
Merit	11870	1470		56.0		6-13		7-19		25		7
Premier	11940	1471		56.5		6-13		7-19		26		8
Rival	11708	1467		56.0		6-14		7-19		26		6
New Renown	11947	1472		58.0		6-11		7-18		24		9
Mindum	5296	1160	58.3	57.0	6-25	6-16	7-22	7-19	35	28	5	5

1. No data in 1933, 1934, 1936, 1937, or 1938 (crop failure).

1 to 4 days later. Black stem rust has occurred in only a relatively small degree in the years during which yields were obtained.

The relative performance of Mindum has been similar to that at Brookings and Highmore.

### Results At Cottonwood

During the five-year period 1932-36, crop failures occurred in 1933, 1934 and 1936 because of extremely adverse conditions of drought and grasshoppers.

One fifty-fifth acre plot tests were planted at Cottonwood for the first time in 1932 and were discontinued in 1936. The results for the two years in which yields were obtained are given in Table 17.

Thatcher has never been grown at Cottonwood but among the varieties tested, Ceres and Reward gave the best performances. The three durum wheat varieties did not differ greatly in performance, although Mindum yielded slightly less than Arnautka and Kubanka.

**Table 17. Annual and Average Yields and Summary of Data on Characters Other Than Yield of the Varieties of Common Spring and Durum Wheat Grown in the 1/50 A. Plot Tests on The Experiment Substation at Cottonwood During the Period 1932 to 1936, Inclusive.<sup>1</sup>**

Variety	C.I.No.	S.D.No.	YIELD IN BUSHEL PER ACRE					2-yr. av. 1932-35	Wt. lbs. per Bu. 1932-35	Date of Heading 1932-35	Ht. plants in inches 1932
			1932	1933 <sup>2</sup>	1934 <sup>2</sup>	1935	1936 <sup>2</sup>				
Ceres	6900	1281	32.7			9.2	21.0	57.0	6-26	33	
Reward	8182	1291	28.3			13.3	20.8	58.5	6-21	29	
Komar (1656)	8004	1296	28.7			9.7	19.2	55.0	6-26	33	
Marquis	3641	515	28.0			7.3	17.7	54.5	6-25	32	
Arnautka	4064	1001	30.0			9.4	19.7	57.0	6-27	37	
Kubanka	1440	75	32.3			6.7	19.5	57.0	6-26	37	
Mindum	5296	1160	29.0			8.0	18.5	57.5	6-28	41	

1. Tests discontinued after 1936.

2. Crop failure due to drought.

### Results of Farmers' Strip Tests or Demonstration Trials

Strip tests in farmers' fields have been conducted for the past 10 years or more, and have been found to be a very effective means for the county agents to demonstrate the relative merits of wheat varieties to the farmer and general public. It should be kept in mind, however, that such tests are not replicated and do not give as accurate yield comparisons as the tests on the experiment stations. Nevertheless, by averaging the results from the several counties in a region, the performance of the varieties for the region as a whole can be fairly accurately ascertained for a given year. The mutual efforts of county agents and farmer cooperators with the Extension Service and the Agronomy Department therefore result in a great deal of valuable information on varietal adaptation in the various sections of South Dakota.

Since Thatcher was first grown in the strip tests in 1935, results from these tests will be given in this bulletin, beginning with the year 1935 and continuing through 1939. Yields and test weights are the only data which have been taken. In reporting the results, the data have been grouped approximately according to the districts shown in Fig. 3. It should be noted that Kingsbury, Miner, McCook and Turner counties, through which the district boundary lines pass, have been included in District 2. Because of conditions similar to those in District 2, Hutchinson and Bon Homme counties also have been included. Brown and Spink counties have been included in District 1.

### Results in 1935

Owing to the severe drought in the two previous years, very few strip tests were sown in 1935. Of the few that were planted, only three counties included Thatcher so the results were confined to the three locations listed in Table 18. Because of the severe epidemic of black stem rust, Thatcher made an outstanding record as compared to the other varieties which yielded only from one-fourth to three-fourths as much. The durums, however, were slightly higher in test weight.

Table 18. Yields and Test Weights of Spring Wheat Varieties in the Extension Farm Demonstration Trials in 1935 With Varietal Averages Expressed in Percent of Thatcher Only for the Locations Where Both the Given Variety and Thatcher Were Grown.

District and County	COMMON SPRING WHEAT VARIETIES				DURUM WHEAT VARIETIES			
	Thatcher	Ceres	Reward	Marquis	Quality (Burbank)	Mindum	Kubanka	Red Durum
YIELDS								
District 1								
Roberts	28.9	9.3		7.3	10.6	22.2	26.3	23.1
Marshall	13.3	9.5		6.2	4.6	7.9	4.6	8.8
Brown	22.4	4.2	10.2	3.0		15.2	10.1	14.5
Percent of Thatcher	100	36	46	26	36	70	63	72
TEST WEIGHTS								
District 1								
Roberts	56.5	45.0		37.0	41.5	54.0	56.0	54.0
Marshall	49.0	37.0		33.0	33.0	49.0	48.0	53.0
Brown	47.0	38.0	43.5	35.0		51.5	52.5	56.0
Percent of Thatcher	100	79	92	69	66	101	103	106

### Results in 1936

Yields were obtained only in the eastern counties because of the severe drought in the remaining sections of the state. Rust was not a factor in 1936 but tolerance to high temperatures and drought played an important role in determining varietal performances. The data in Table 19 show that Ceres was superior to Thatcher in both yield and test weight in District 1. In District 2, Thatcher yielded 18 percent more than Ceres but Ceres was 6 percent higher in test weight. The durums all yielded less than Thatcher but had somewhat higher test weights.

Table 19. Yields and Test Weights of Spring Wheat Varieties in the Extension Farm Demonstration Trials in 1936 With Varietal Averages Expressed in Percent of Thatcher Only for the Locations Where Both the Given Variety and Thatcher Were Grown.

District and County	COMMON SPRING WHEAT VARIETIES						Quality (Burbank)	DURUM WHEAT VARIETIES		
	Thatcher	Ceres	Reward	Marquis	Marquillo	Hope		Mindum	Kubanka	Red Durum
YIELDS										
<b>District 1</b>										
Brown (Kreuger)	4.7	5.9	4.8	3.8				.3	2.3	1.2
Brown (McHugh)	9.8	11.8	5.8	3.8				7.3		8.2
Deuel (Kreuger)	5.3	7.5		6.5	5.5	3.3				
Deuel (Larson)	6.3	4.0	7.3	5.1	3.7	0				
Deuel (Peterson)	6.0	6.3	7.6	6.0	4.6	1.9				
Hamlin	5.3	4.2	2.7	3.2						
<b>Percent of Thatcher</b>	<b>100</b>	<b>106</b>	<b>88</b>	<b>76</b>	<b>78</b>	<b>46</b>		<b>52</b>	<b>49</b>	<b>65</b>
<b>District 2</b>										
Miner	15.6	13.3	11.3	12.6				7.5		6.5
McCook	10.6	11.4	11.4	8.5						
Hanson	8.7	8.1	9.2	7.5			17.0			
Hutchinson	6.4	6.0	6.1				10.0	3.3		3.2
Union	37.4	25.6	26.2	20.2				24.8		26.8
<b>Percent of Thatcher</b>	<b>100</b>	<b>47</b>	<b>46</b>	<b>25</b>	<b>51</b>	<b>47</b>	<b>178</b>	<b>65</b>		<b>67</b>
TEST WEIGHTS										
<b>District 1</b>										
Brown (Kreuger)	49.0	53.0	55.0	50.0				55.0		56.0
Brown (McHugh)	53.0	58.0	56.0	50.0				56.0		57.0
Deuel (Kreuger)	44.0	50.0		46.5	44.0	42.0				
Deuel (Larson)	43.0	46.0	52.0	44.0	42.0					
Deuel (Peterson)	46.0	52.0	54.0	46.0	46.0	40.0				
Hamlin	44.0	52.0	48.0	52.0						
<b>Percent of Thatcher</b>	<b>100</b>	<b>111</b>	<b>112</b>	<b>103</b>	<b>99</b>	<b>91</b>		<b>108</b>		<b>110</b>
<b>District 2</b>										
Miner	50.0	52.5	53.0	52.0						
McCook	48.0	54.0	54.0	45.0				45.0		46.0
Hanson	44.0	50.0	45.0	48.0						
Hutchinson	44.0	49.0	46.0				45.0	50.0		50.0
Union	57.0	52.0	62.0	52.5			48.0	56.0		58.0
<b>Percent of Thatcher</b>	<b>100</b>	<b>106</b>	<b>106</b>	<b>99</b>			<b>106</b>	<b>101</b>		<b>103</b>

### Results in 1937

Another severe rust epidemic occurred in 1937 so that Thatcher again made an outstanding yield record, especially in Districts 1 and 2, as shown in Table 20. Drought and grasshoppers also were factors in certain localities as indicated by the lower yields of Thatcher in some counties. In Districts 3 and 5, where rust was a minor factor, Ceres yielded only slightly less than Thatcher while Reward yielded somewhat higher. Mindum durum yielded 10 percent less than Thatcher in District 2 and the same in the one location in District 3.

Fairly good test weights were maintained by all varieties although the actual test weights were in general quite low. From Table 21, it may be seen that in District 2, where rust was not as severe as in District 1, Ceres, Reward and the durums tested as high or higher than Thatcher while Marquis was appreciably lower. Most of the other varieties are equal or superior to Thatcher in Districts 3 and 5. As a group, the durums had a higher test weight than Thatcher.

### Results in 1938

The season of 1938 was fairly favorable for wheat production from the standpoint of moisture and temperature. Grasshopper infestations, however, were severe in most areas except the east central and northeast portions. A moderately severe epidemic of black stem rust occurred in the eastern districts on susceptible varieties but a large acreage of Thatcher resulted in relatively small losses. Orange leaf rust occurred in one of the severest epidemics experienced in the history of wheat production in eastern South Dakota. This disease is not as destructive as black stem rust but nevertheless causes appreciable reductions in yield and test weight.

From Table 22, it may be seen that the yields of Thatcher were higher than those of the other common spring wheat varieties in all but District 4. Quality yielded slightly higher in one of the locations in Hutchinson county. Mindum durum yielded as well or better than Thatcher in all but District 1, perhaps because of the longer growing season which permitted it to approach its maximum development.

The test weights did not differ greatly among the varieties of common spring wheat, as shown in Table 23. In general, Reward had the highest average test weight for all districts while Marquis had the lowest. The other varieties were about equal or slightly superior to Thatcher. The durums, as usual, exceeded the common spring wheats in test weight.

### Results in 1939

The season of 1939 was somewhat similar to that of 1938. The rusts, however, were not as severe in the eastern district.

Of interest in Table 24 are the performances of the two new varieties, Rival and Pilot, under farm conditions. Pilot yielded as well or better than Thatcher in the first four districts while Rival exceeded Thatcher in yield only in Districts 1 and 3. Both of these wheats are similar in performance to Ceres

when rust is not a serious factor. As shown by the data, Ceres surpassed Thatcher in yield in all but District 4 where only one test was grown. In District 1, three of the durumms outyielded Thatcher; however, in the remaining districts, the highest durumms yielded the same or less.

The data on test weights in Table 25 are similar to those in 1938. Rival and Pilot averaged about the same as or slightly higher than Thatcher in all but District 3 where their later maturity no doubt placed them at a slight disadvantage. The durumms were again somewhat higher in test weight than the common spring wheats.

### **Milling and Baking Data on Hard Red Spring Wheat Varieties**

The yield and quality of flour are important considerations in the evaluation of varieties of wheat. A high yielding variety of wheat of inferior milling and baking quality is not acceptable to the market and therefore cannot command premium prices paid for high quality wheat.

Milling data usually include test weight per bushel, protein content, yield of flour, and ash content. Weight per bushel is associated positively with yield of flour while protein content tends to be correlated with flour strength and loaf volume. A high ash content is undesirable in that it is associated with a gray color in the flour and loaf with an increase in acidity of the flour.

Baking results also include data on several characteristics. The water-absorbing power of flour is considered as an index of the quantity and quality of gluten, a high gluten flour absorbing more water than a low gluten flour. Loaf volume is considered as an expression of flour strength while loaf weight indicates the weight remaining after the baking process. The loaf texture and loaf color scores refer to the appearance of the baked bread, high scores indicating better appearance.

Owing to lack of equipment for conducting milling and baking studies on wheat, it has been necessary to solicit the cooperation of the Grain Division in the Bureau of Plant Industry and Agricultural Economics of the United States Department of Agriculture. This cooperation has been successfully arranged through the courtesy of J. A. Clark and Dr. S. C. Salmon of the Bureau of Plant Industry. The data thus obtained are presented in Table 26, using Thatcher as a standard for comparison.

Thatcher appears to be outstanding from the standpoint of milling and baking quality as well as in field performance. In protein content, it has been only slightly surpassed by Pilot, Merit and Premier. Its flour yield has been exceeded only slightly by Rival, Renown, Hope x Ceres (1463), Vesta, Merit and Premier. Only Vesta, Merit, and Premier have been lower in ash content as determined from only one year's data. In water absorption, Thatcher was exceeded by over one percent only by Merit and Premier in 1939. No other variety has been higher in loaf volume, and its loaf weight has been lower than that of all other varieties. Ceres, Marquis, Pilot and Rival have exceeded it slightly in loaf texture score but it has been superior to all others except Vesta, Merit and Premier in loaf color score.

Table 20. Yields of Spring Wheat Varieties in the Extension Farm Demonstration Trials in 1937 with Varietal Averages Expressed in Percent of Thatcher Only for the Locations Where Both the Given Variety and Thatcher Were Grown.

District and County	COMMON SPRING WHEAT VARIETIES						DURUM WHEAT VARIETIES				
	Thatcher	Ceres	Reward	Marquis	Marquillo	Hope	Quality (Burbank)	Mindum	Kubanka	Nodak	Red Durum
<b>District 1</b>											
Marshall	10.9	5.1	6.9	3.0	4.1			7.9			13.3
Day	4.8	2.3	1.3	1.9				3.9		3.4	7.0
Brown (Keeler)	3.0	1.8	3.9	.9				.03			.9
Brown (McHugh)	3.6	1.8	.8	1.5				1.5			3.0
Grant	16.4	7.3	7.2	3.2				12.2			14.9
Codington (Fox)	15.4	5.2	3.2	3.2				10.9			10.8
Codington (Robbins)	15.3	10.9	7.6	6.5				24.7			15.9
Deuel (Kreger)	12.7	5.9	7.1								10.7
Deuel (Larson)	13.6	5.0	4.1	2.4	8.3	6.8		10.7			13.5
Deuel (Peterson)	18.7	9.0	11.1	3.8		8.3		13.0			15.8
<b>Percent of Thatcher</b>	<b>100</b>	<b>47</b>	<b>46</b>	<b>25</b>	<b>51</b>	<b>47</b>		<b>84</b>		<b>70</b>	<b>92</b>
<b>District 2</b>											
Kingsbury	5.6	3.9	3.7	2.6		2.3		6.8			6.7
Miner	5.1	3.4	5.8	2.3				5.2			5.7
McCook	22.8	10.5	8.3	4.4				15.2			13.5
Hutchinson	9.6	6.8	11.5	5.4			14.2	12.9			9.6
Union	25.3	9.6	10.6	7.3				24.6			18.5
<b>Percent of Thatcher</b>	<b>100</b>	<b>58</b>	<b>68</b>	<b>38</b>		<b>41</b>	<b>148</b>	<b>110</b>			<b>92</b>
<b>District 3</b>											
Walworth	3.0	2.6	4.2	2.3				3.0			1.6
Dewey (Bailey)	3.3	4.0	5.6	3.6							
Dewey (Scherer)	7.0	5.8		4.3							
<b>Percent of Thatcher</b>	<b>100</b>	<b>93</b>	<b>155</b>	<b>77</b>				<b>100</b>			<b>53</b>
<b>District 5</b>											
Brule	7.0							6.4			
Lyman	7.5	6.1	8.8	4.6		2.8		6.9	4.8		
<b>Percent of Thatcher</b>	<b>100</b>	<b>91</b>	<b>117</b>	<b>64</b>		<b>40</b>		<b>92</b>	<b>64</b>		

Table 21. Test Weights of Spring Wheat Varieties in the Extension Farm Demonstration Trials in 1937 With Varietal Averages Expressed in Percent of Thatcher Only for the Locations Where Both the Given Variety and Thatcher Were Grown.

District and County	COMMON SPRING WHEAT VARIETIES						DURUM WHEAT VARIETIES				
	Thatcher	Ceres	Reward	Marquis	Marquillo	Hope	Quality (Burbank)	Mindum	Kubanka	Nodak	Red Durum
<b>District 1</b>											
Marshall	52.0	46.0	44.0	47.0	46.0			54.5			61.0
Day	54.0	44.0	42.0	42.0				56.0		58.0	62.0
Brown (Keeler)	52.0	56.0	55.0	52.0				45.0			54.0
Brown (McHugh)	57.0	53.0	52.0	50.0				52.0			60.0
Grant	54.0	49.0	49.0	41.0				57.0			56.0
Codington (Fox)	52.0	50.0	44.0	48.0				53.0			58.0
Codington (Robbins)	47.0	56.0	58.0	54.0				60.0			59.0
Deuel (Kreger)	52.5	42.5	45.0								53.0
Deuel (Larson)	52.0	44.0	38.0	43.0	43.0	45.5		50.0			56.5
Deuel (Peterson)	54.0	44.0	53.0	42.0		44.0		57.0			61.0
<b>Percent of Thatcher</b>	<b>100</b>	<b>92</b>	<b>91</b>	<b>88</b>	<b>85</b>	<b>84</b>		<b>102</b>		<b>107</b>	<b>110</b>
<b>District 2</b>											
Kingsbury	54.0	58.0	54.0	50.0		54.0		62.0			63.0
Miner	47.0	57.0	53.0	48.0				61.0			56.0
McCook	58.0	52.0	50.0	40.0				62.0			61.0
Hutchinson	43.5	47.0	48.0	44.0			45.5	52.0			54.0
Union	53.0	44.0	53.0	41.0				53.0			54.0
<b>Percent of Thatcher</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>87</b>		<b>100</b>		<b>104</b>			<b>113</b>
<b>District 3</b>											
Walworth	42.0	52.0	44.0	46.0				51.0			52.0
Dewey (Bailey)	41.0	54.0	44.0	48.0							
Dewey (Scherer)	54.0	58.0		48.0							
<b>Percent of Thatcher</b>	<b>100</b>	<b>119</b>	<b>106</b>	<b>103</b>				<b>121</b>			<b>123</b>
<b>District 5</b>											
Brule	47.5							43.0			
Lyman	45.0	49.0	57.0	43.0		45.0		47.5	45.0		
<b>Percent of Thatcher</b>	<b>100</b>	<b>108</b>	<b>126</b>	<b>95</b>		<b>95</b>		<b>97</b>	<b>100</b>		



Table 22. Yields of Spring Wheat Varieties in the Extension Farm Demonstration Trials in 1938 with Varietal Averages Expressed in Percent of Thatcher Only for the Locations Where Both the Given Variety and Thatcher Were Grown.

District and County	COMMON SPRING WHEAT VARIETIES						Quality (Burbank)	DURUM WHEAT VARIETIES	
	Thatcher	Ceres	Reward	Marquis	Marquillo	Hope		Mindum	Red Durum
<b>District 1</b>									
Roberts	26.5	21.0		12.7				30.0	22.8
Marshall	25.6	8.9	16.0	12.2				27.7	10.5
Brown (Keeler)	15.4	14.9	13.6	13.4				16.6	10.9
Brown (McHugh)	32.4	21.8	23.4	19.6				28.6	25.3
Grant	18.8	14.5	13.9	13.7	18.9	16.1		30.1	24.3
Codington	11.3	3.2	8.8					14.8	13.3
Deuel (Kreger)	10.0	4.9	11.6	4.3	9.1	9.8			13.1
Deuel (Larson)	10.0	5.8	7.9	1.6	12.5			20.4	
Deuel (Peterson)	10.3	10.5		10.0	10.4			27.9	10.1
Hamlin	9.1	3.4		2.6	2.7	4.8		3.3	10.4
<b>Percent of Thatcher</b>	<b>100</b>	<b>64</b>	<b>77</b>	<b>57</b>	<b>77</b>	<b>81</b>		<b>81</b>	<b>84</b>
<b>District 2</b>									
Kingsbury	17.8	13.3	16.2						23.3
McCook	7.3	11.4		10.1				21.0	15.6
Turner	18.1	7.3	12.4	6.0				22.5	12.6
Hutchinson (McClain)	17.2	9.4	16.9	11.3				18.2	15.2
Hutchinson (Rames)	11.9	6.2	9.6	2.6			13.0	10.2	6.2
Hutchinson (Rardin)	6.0	7.0	5.1	4.0				6.4	3.6
Clay	5.9	9.4		16.2				21.1	16.0
Bon Homme (Cole)	17.2	9.4	16.9	11.3				18.2	15.2
Bon Homme (Minow)	20.0	4.3	11.3	22.4				13.7	15.2
<b>Percent of Thatcher</b>	<b>100</b>	<b>64</b>	<b>81</b>	<b>74</b>			<b>108</b>	<b>115</b>	<b>82</b>

Continued on next page.

Table 22, (continued)

District and County	COMMON SPRING WHEAT VARIETIES						Quality (Burbank)	DURUM WHEAT VARIETIES	
	Thatcher	Ceres	Reward	Marquis	Marquillo	Hope		Mindum	Red Durum
<b>District 3</b>									
Edmunds	11.4	9.6	14.0	7.0				25.0	9.7
Walworth	25.1	12.0	16.6	6.3				21.9	22.8
Dewey	2.0	.6	7.5	5.8				1.5	
<b>Percent of Thatcher</b>	<b>100</b>	<b>58</b>	<b>100</b>	<b>50</b>				<b>123</b>	<b>89</b>
<b>District 4</b>									
Beadle	10.2	8.6	10.2	8.3				12.6	13.9
Sully	17.3	20.0	19.5	15.0				14.9	19.0
<b>Percent of Thatcher</b>	<b>100</b>	<b>104</b>	<b>108</b>	<b>85</b>				<b>100</b>	<b>119</b>
<b>District 5</b>									
Sanborn	20.0	11.8		8.7				27.5	23.0
Brule	13.6	9.8		10.0				20.9	14.0
Lyman	18.0	5.8	12.0	7.0				5.8	.9
Custer	4.5	3.6	7.4						
<b>Percent of Thatcher</b>	<b>100</b>	<b>55</b>	<b>86</b>	<b>50</b>				<b>105</b>	<b>73</b>

Table 23. Test Weights per Bushel of Spring Wheat Varieties in the Extension Farm Demonstration Trials in 1938 with Varietal Averages Expressed in Percent of Thatcher Only for the Locations Where Both the Given Variety and Thatcher Were Grown.

District and County	COMMON SPRING WHEAT VARIETIES						DURUM WHEAT VARIETIES		
	Thatcher	Ceres	Reward	Marquis	Marquillo	Hope	Quality (Burbank)	Mindum	Red Durum
<b>District 1</b>									
Roberts	54.0	50.0		44.0				58.0	52.5
Marshall	56.0	49.0	54.0	46.0				60.0	52.0
Brown (Keeler)	59.0	59.0	61.0	58.0				64.0	60.0
Brown (McHugh)	59.0	57.0	62.0	55.0				64.0	59.0
Grant	54.5	54.0	58.0	52.0	56.0	55.0		63.0	59.0
Codington	53.0	40.0	54.0					59.5	59.5
Deuel (Kreger)	50.0	48.0	54.0	38.0	52.0	56.0			58.0
Deuel (Larson)	48.5	48.0	46.0	48.0	52.0			58.0	
Deuel (Peterson)	54.0	58.0		56.0	58.0			61.5	60.0
Hamlin	53.0	51.0		48.0	51.0	54.0		58.0	59.5
<b>Percent of Thatcher</b>	<b>100</b>	<b>95</b>	<b>102</b>	<b>91</b>	<b>103</b>	<b>104</b>		<b>111</b>	<b>105</b>
<b>District 2</b>									
Kingsbury	57.0	55.0	56.0						59.0
McCook	58.5	59.0		53.0				62.0	58.0
Turner	53.0	47.0	52.0	43.0				58.0	52.5
Hutchinson (McClain)	54.0	56.0	60.0	52.0				60.0	60.0
Hutchinson (Rames)	51.0	49.0	55.0	48.0			51.0	55.0	52.0
Hutchinson (Rardin)	54.0	55.0	54.0	50.0				56.0	54.0
Clay	53.0	52.5		54.5				58.0	54.0
Bon Homme (Cole)	54.0	56.0	60.0	52.0				60.0	60.0
Bon Homme (Minow)	53.0	53.0	53.0	56.0				60.0	56.0
<b>Percent of Thatcher</b>	<b>100</b>	<b>100</b>	<b>103</b>	<b>95</b>			<b>100</b>	<b>108</b>	<b>103</b>

Continued on next page.

Table 23, (continued)

District and County	COMMON SPRING WHEAT VARIETIES						DURUM WHEAT VARIETIES		
	Thatcher	Ceres	Reward	Marquis	Marquillo	Hope	Quality (Burbank)	Mindum	Red Durum
<b>District 3</b>									
Edmunds	55.0	55.0	58.0	52.0				63.0	59.0
Walworth	59.0	55.0	57.0	44.0				61.5	56.0
Dewey	42.0	40.0	53.0	52.0				56.0	
<b>Percent of Thatcher</b>	<b>100</b>	<b>96</b>	<b>107</b>	<b>95</b>				<b>115</b>	<b>100</b>
<b>District 4</b>									
Beadle	55.5	55.0	58.0	50.0				62.0	59.0
Sully	52.0	56.0	56.0	52.0				61.0	60.5
<b>Percent of Thatcher</b>	<b>100</b>	<b>103</b>	<b>106</b>	<b>95</b>				<b>114</b>	<b>111</b>
<b>District 5</b>									
Sanborn	57.0	55.0		50.5				60.0	60.0
Brule	55.0	53.0		49.0				54.0	54.0
Lyman	52.0	44.0	51.0	39.0				60.0	56.0
Custer	58.0	58.0	58.0						
<b>Percent of Thatcher</b>	<b>100</b>	<b>94</b>	<b>99</b>	<b>84</b>				<b>105</b>	<b>103</b>

Table 24. Yields of Spring Wheat Varieties in the Extension Farm Demonstration Trials in 1939 with Varietal Averages Expressed in Percent of Thatcher Only for the Locations Where Both the Given Variety and Thatcher Were Grown.

District and County	COMMON SPRING WHEAT VARIETIES										DURUM WHEAT VARIETIES					
	Thatcher	Ceres	Reward	Marquis	Rival	Pilot	Hope (Burbank)	Komar 1656	Nord- haugen	Re- nown	Marvel	Min- dum	Kubanka	Black Bearded Durum	Nodak	Red Durum
<b>District 1</b>																
Roberts	17.8	30.2	19.9		24.5	25.6			16.0	19.6						31.7
Brown-Marshal	28.8	31.0	19.0		35.0	31.0			26.0			40.9				33.0
Brown (Keeler)	9.1	12.9	7.8		9.7	8.6						33.0				
Brown (McHugh)	19.1	32.4	25.5		25.6	26.7						9.2				27.3
Day	30.0	22.3	20.6		23.8	29.5						25.3		22.6		30.0
Grant	18.1	19.9	9.3		17.6	20.3						30.8				19.2
Codington	35.0	27.5	27.9		41.7	44.1						20.4				33.7
Clark	12.8	16.4	13.9	8.5								44.8				15.3
Spink	9.5	13.6			10.0	21.9						22.4				24.0
Deuel (Kreger)	18.0	19.0	10.3		23.7	25.5										8.2
Deuel (Larson)	18.4	22.5			34.4	32.1						13.0				20.5
Deuel (Peterson)	18.4	13.6			14.2	14.5						27.3				15.1
Hamlin	19.6	25.1	21.8		27.0	30.4						16.6	21.8			23.5
<b>Percent of Thatcher</b>	<b>100</b>	<b>112</b>	<b>84</b>	<b>64</b>	<b>118</b>	<b>128</b>			<b>90</b>	<b>110</b>		<b>136</b>	<b>111</b>	<b>75</b>		<b>116</b>
<b>District 2</b>																
Kingsbury	19.9	22.8	15.6		20.8	20.8						19.8				22.3
Lake	11.0	10.0			10.3	9.2						7.4				7.3
McCook																
Turner	28.5	32.7	28.5		26.3	19.6						27.4				46.9
Hutchinson (Lindeman)	18.5	21.0	24.5		26.3	17.4	13.9					11.3	21.7			18.5
Hutchinson (Mogeh)	15.6	17.8	14.5		16.8	14.1	19.4						14.0			
Hutchinson (Rames)	16.1	16.5	17.2		15.6	14.0	18.4					11.3	8.4			13.0
Union	10.7	5.3	6.8		18.1	6.5							7.1			7.7
<b>Percent of Thatcher</b>	<b>100</b>	<b>104</b>	<b>98</b>		<b>111</b>	<b>84</b>	<b>102</b>					<b>65</b>	<b>88</b>			<b>100</b>

Continued on next page.

Table 24, (continued)

District and County	COMMON SPRING WHEAT VARIETIES								DURUM WHEAT VARIETIES								
	Thatcher	Ceres	Reward	Marquis	Rival	Pilot	Quality Hope (Burbank)		Komar 1656	Nord haugen	Re- nown	Marvel	Min- dum	Kubanka	Black Bearded Durum	Nodak	Red Durum
<b>District 3</b>																	
McPherson	17.8	19.6	20.9		17.1	17.1						2.5	13.4				19.0
Campbell	8.5	14.6			15.6	9.5							8.2				11.4
Corson	5.7	5.3	5.0		6.7	6.7							3.6				3.0
Edmunds	7.4	8.2	5.3	6.8									9.5				5.7
Dewey (Bailey)	7.9	5.7	7.1		4.9	3.5							5.4				4.5
Dewey (Rahberg)	9.0	7.1	7.4		4.9	5.8							9.0				8.7
<b>Percent of Thatcher</b>	<b>100</b>	<b>107</b>	<b>96</b>	<b>91</b>	<b>102</b>	<b>87</b>						<b>14</b>	<b>87</b>				<b>93</b>
<b>District 4</b>																	
Hyde	19.3	16.4	11.5		19.3	15.4							6.0				6.2
<b>Percent of Thatcher</b>	<b>100</b>	<b>85</b>	<b>59</b>		<b>100</b>	<b>79</b>							<b>31</b>				<b>32</b>
<b>District 5</b>																	
Sanborn	20.7	15.6	15.0	11.8	20.2	19.2		17.3				18.9	19.6				19.3
Douglas	1.2	3.7	.6		.7	.7							.4				.7
Brule (Cooke)	18.0	22.1	15.8				17.6	19.1					16.4	17.9	20.4		
Brule (Kunzweiler)	8.9	8.2	3.7			8.2	8.0	4.3					6.8	6.4	6.4		
Lyman		17.5	19.2	9.1	17.5	16.8							15.8	13.9	10.0		24.0
Gregory	15.5		10.7		17.2	16.9			11.0				18.3				
<b>Percent of Thatcher</b>	<b>100</b>	<b>101</b>	<b>71</b>	<b>57</b>	<b>100</b>	<b>97</b>	<b>95</b>	<b>85</b>	<b>71</b>			<b>91</b>	<b>96</b>	<b>90</b>	<b>100</b>		<b>91</b>

Table 25. Test Weights of Spring Wheat Varieties in the Extension Farm Demonstration Trials in 1939 with Varietal Averages Expressed in Percent of Thatcher Only for the Locations Where Both the Given Variety and Thatcher Were Grown.

District and County	COMMON SPRING WHEAT VARIETIES							DURUM WHEAT VARIETIES								
	Thatcher	Ceres	Reward	Marquis	Rival	Pilot	Quality Hope (Burbank)	Komar 1656	Nord- haugen	Re- nowa	Marvel	Min- dum	Kubanka	Black Bearded Durum	Nodak	Red Durum
<b>District 1</b>																
Roberts	54.0	55.0	59.0		57.0	56.0		53.0	56.5							58.0
Brown-Marshall	59.5	60.5	62.5		60.5	57.5		58.0				63.0				63.0
Brown (Keeler)	56.5	58.5	57.0		57.5	55.0						58.0				
Brown (McHugh)	57.5	58.0	62.0		56.0	52.8						55.5				56.0
Day	60.0	58.5	61.0		58.0	55.5					58.0			57.0		57.0
Grant	57.5	57.5	58.5		58.0	57.5						60.0				59.0
Codington	56.5	55.0	59.5		56.5	56.5						59.5				55.0
Clark												58.0				
Spink	54.0	59.0			56.0	53.0										57.0
Deuel (Kreger)	56.5	57.5	54.0		56.5	57.0						51.0				52.0
Deuel (Larsen)	53.0	54.5			56.0	56.0						61.5				55.5
Deuel (Peterson)	53.0	55.0			55.0	55.0						57.5				55.0
Hamlin	55.5	55.0	60.0		57.5	56.0							54.5			56.5
<b>Percent of Thatcher</b>	<b>100</b>	<b>101</b>	<b>103</b>		<b>101</b>	<b>99</b>		<b>98</b>	<b>105</b>			<b>103</b>		<b>98</b>	<b>95</b>	<b>101</b>
<b>District 2</b>																
Kingsbury	58.0	60.0	61.0		60.0	59.0						62.5				61.5
Lake	53.0	53.5			55.5	53.0						56.5				56.0
McCook																
Turner	55.0	57.0	59.0		56.0	52.5						59.0				59.5
Hutchinson (Lindeman)	57.5	59.0	58.0		57.5	56.5	59.5				57.3	60.0				58.0
Hutchinson (Mogeh)	57.0	58.5	60.0		58.0	57.0	59.0					60.5				
Hutchinson (Rames)	55.0	59.0	59.0		57.0	56.5	58.0				57.5	58.0				58.5
Union	54.0		59.0		57.0	54.5						61.0				55.0
<b>Percent of Thatcher</b>	<b>100</b>	<b>106</b>	<b>106</b>		<b>103</b>	<b>100</b>	<b>104</b>					<b>102</b>	<b>106</b>			<b>104</b>

Continued on next page.

Table 25, (continued).

District and County	COMMON SPRING WHEAT VARIETIES Quality							DURUM WHEAT VARIETIES								
	Thatcher	Ceres	Reward	Marquis	Rival	Pilot	Hope (Burbank)	Komar 1656	Nord haugen	Re- nown	Mar- vel	Min- dum	Kubanka	Black Bearded Durum	Nodak	Red Durum
<b>District 3</b>																
McPherson	55.5	56.5	63.0		50.0	53.0						58.0				60.0
Campbell	56.0	56.0			58.0	54.5						58.0				54.5
Corson	50.5	43.5	58.0		49.0	50.5										
Edmunds	56.0	57.5	56.2	52.0								59.5				56.0
Dewey (Bailey)	49.0	52.0	52.0		47.5	43.0						51.5				52.5
Dewey (Rahberg)	48.5	52.0	50.0		47.5	46.0						50.0				50.0
<b>Percent of Thatcher</b>	<b>100</b>	<b>100</b>	<b>102</b>	<b>93</b>	<b>97</b>	<b>95</b>						<b>104</b>				<b>103</b>
<b>District 4</b>																
Hyde	54.5	56.0	58.0		54.5	55.0						54.0				55.5
<b>Percent of Thatcher</b>	<b>100</b>	<b>102</b>	<b>106</b>		<b>100</b>	<b>100</b>						<b>100</b>				<b>101</b>
<b>District 5</b>																
Sanborn	58.5	58.0	61.0	56.0	58.0	58.0	60.5			60.0	61.0					59.0
Douglas	54.0		59.0		57.0	54.5					61.0					55.0
Brule (Cooke)	53.0	58.5	60.0				50.0	57.0			57.0	58.5	57.5			
Brule (Kunzweiler)	51.0	56.0	57.0		55.0	52.5	51.0				52.0	59.0	57.5			
Lyman		55.5	55.0	51.5	56.5	57.0					57.5	57.0	55.0			59.0
Gregory	55.0		55.0		56.0	56.0		52.5			59.0					
<b>Percent of Thatcher</b>	<b>100</b>	<b>106</b>	<b>107</b>	<b>96</b>	<b>102</b>	<b>102</b>	<b>98</b>	<b>103</b>	<b>95</b>		<b>102</b>	<b>106</b>	<b>112</b>	<b>110</b>		<b>101</b>

Spring Wheat Varieties in South Dakota



Table 26. Summary of Milling and Baking Data on Common Spring Wheat Varieties Grown in the 1/66 A. Plot Tests at Brookings During the Period 1930 to 1939, Inclusive.<sup>1</sup>

Variety	Years Included in Average	MILLING RESULTS				BAKING RESULTS				
		Weight lbs. per bushel	Percent protein in wheat	Yield flour in percent <sup>2</sup>	Percent ash in flour <sup>2</sup>	Percent water absorption	Loaf volume <sup>4</sup> c.c.	Weight of loaf gms. <sup>3</sup>	Loaf texture score <sup>4</sup>	Loaf color score <sup>4</sup>
Thatcher	} 30, 32, 35, 36, 37	54.5	16.6	68.5	.47	62	683	144	82	90
Ceres		52.3	15.6	60.7	.51	63	663	147	83	87
Thatcher	} 30, 32, 37	55.1	16.0	69.5	.46	62	605	145	80	88
Marquis		51.6	14.8	64.8	.49	62	573	145	83	81
Thatcher	} 35-39, incl.	54.2	16.6	68.4	.49	63	846	145	87	83
Pilot		52.8	16.9	66.9	.51	64	809	147	89	80
Thatcher	} 36-39, incl.	54.0	16.4	68.4	.49	63	886	145	87	83
Rival		55.6	15.0	70.1	.49	63	805	146	90	76
Thatcher	} 37-38, incl.	53.0	16.2	69.4	.47		824		85	73
Renown		55.9	16.1	70.0	.47		792		79	72
Thatcher	} 38-39, incl.	54.5	16.4	69.1	.51	63	879	146	89	81
Hope x Ceres, S.D. 1463		56.1	15.8	69.9	.53	63	826	147	83	79
Thatcher	} 38 only	50.9	16.7	68.7	.49		847		83	70
Vesta		55.4	15.0	72.2	.46		721		80	75
Thatcher	} 39 only	58.1	16.0	69.5	.52	63	911	146	94	91
Merit		57.4	16.1	71.1	.43	71	889	153	91	94
Premier		59.7	15.9	71.5	.43	70	802	154	89	93

1. Data obtained by the Division of Cereal Crops and Diseases in cooperation with the Grain Division, Bureaus of Plant Industry and Agricultural Economics of the United States Department of Agriculture.

2. No data in 1935.

3. No data in 1935, 1937, and 1938.

4. Based on one method (1930-1935), average of two methods (1936), and average of four methods (1937-1939, incl.)

### Summary of Varietal Recommendations for South Dakota

The chief purpose of experiment station and farmers' strip tests of wheat varieties is to determine which varieties, whether old or new, are best adapted to the various sections of South Dakota. Varietal recommendations, based on the results presented in this bulletin, are presented in Table 27 according to the districts shown in Figure 3.

**Table 27. Summary of Varietal Recommendations for Varieties and Classes of Spring Wheat in the Wheat-producing Districts of South Dakota.**

DISTRICT <sup>1</sup>	CLASS	VARIETIES
No. 1—Durum or northeastern area	1. Hard red spring	Thatcher, Ceres (western part)
	2. Durum (limited acreage)	Mindum
No. 2—East Central area	1. Hard red spring	Thatcher
No. 3—Northern hard red spring area	1. Hard red spring	Ceres, Thatcher (eastern part), Reward (central & western part)
	2. Durum (limited acreage)	Mindum, Kubanka, Arnautka
No. 4—Central hard red spring area	1. Hard red spring	Ceres, Thatcher (eastern part), Reward (central & western part)
	2. Durum (limited acreage)	Mindum, Arnautka, Kubanka
No. 5—Southern hard red spring area	1. Hard red spring	Ceres, Thatcher (eastern part), Reward (central & western part)
	2. Durum (limited acreage in central part)	Mindum, Arnautka, Kubanka
No. 6—Hard red winter area	1. Hard red spring	Ceres (central and western part), Thatcher (eastern part)

1. See Figure 3.

Thatcher is the outstanding variety of hard red spring wheat in eastern South Dakota where rust is likely to be a serious hazard. A transitional area, beginning about one-fifth to one-fourth of the distance in from the eastern border and continuing about one-half the distance across the state, appears to be suited to the production of both Thatcher and Ceres. Ceres is recommended as the leading variety in the western half of South Dakota or wherever grasshoppers, heat, and drought are more serious hazards than black stem rust. Reward may be grown to advantage as an early-maturing variety in the central and western portions of Districts 3, 4, and 5, where stem rust epidemics are not likely to occur. However, though it is early enough in some seasons to escape grasshopper damage, Reward is much more susceptible to grasshopper attacks than Ceres or Thatcher. New varieties such as Pilot, Rival, Renown, and Nordhaugen have not been grown long enough to permit definite recommendations.

Mindum is the leading variety of durum wheat but Arnautka and Kubanka also may be grown to advantage in certain districts as indicated in Table 27. Pure seed of Mindum, however, is much easier to obtain than pure seed of Kubanka and Arnautka in most sections of the state.

A shift from durum to hard red spring wheat would also seem desirable in the areas where black stem rust has limited hard red spring wheat production and encouraged durum wheat production. The availability of rust-resistant varieties and higher prices are the two main factors which would justify such a recommendation.

### Descriptions and Origins of the Varieties Tested

In the preceding discussion, emphasis has been given to the agronomic performance and quality of the varieties of common spring and durum wheat which have been tested. It is also important that farmers, county agents, teachers and other persons interested in wheat production be able to identify the varieties in order that they might be more critical of varietal purity. Of further interest is the origin and history of each variety. In the brief varietal discussions which follow, free use has been made of the publications of Clark and Bayles (1935), Newman, Fraser and Whiteside (1939), Klages (1931), and Hayes, et al (1936). The discussions have been written in telegraphic style for the sake of brevity.

#### Common Spring Wheat Varieties

**Apex, C.I. No. 11636.** Beardless, very similar to Marquis but tip awns generally shorter, beaks slightly sharper, shoulders more elevated with less narrowing toward the tip. Kernel similar to Marquis. Three to five days later and slightly taller, but weaker straw than Thatcher. Resistant to stem rust, susceptible to leaf rust, and moderately resistant to bunt and loose smut. Decidedly inferior to Thatcher in yield and test weight under South Dakota conditions. Milling and baking qualities acceptable in Canada.

Developed at University of Saskatchewan from cross (H44 x Double Cross) x Marquis, made in 1927. Distributed in 1937. About 300,000 acres grown in Western Canada in 1939. Not recommended in South Dakota.

**Ceres, S.D. No. 1281, C.I. No. 6900.** Bearded, chaff white and smooth, beaks slightly turned in, broadened at the base, varying considerably in length from 2 to 10 mm. Kernels red but subject to bleaching. Intermediate between Marquis and Thatcher in maturity. Straw as tall as Marquis but somewhat weaker. More resistant to stem rust than Marquis but nevertheless severely damaged in 1935 and 1937. Susceptible to leaf rust and very susceptible to bunt and loose smut. About equal to Thatcher in yield and somewhat superior in test weight when stem rust is not a factor in South Dakota. Good milling and baking qualities.

Developed from the cross, Marquis x Kota, made in 1918 at the North Dakota Agricultural Experiment Station. Distributed in 1926. Over 1,000,000 acres sown in South Dakota in 1939. Recommended in South Dakota wherever stem rust is not a serious hazard.

**Coronation, C.I. No. 11475.** Bearded, with awns usually stiff and spreading and three to four inches long. Glumes smooth, white to yellowish in color. Beaks narrow and 2.4 mm. or more in length. Kernels red, hard. Maturity about the same as Marquis. Highly resistant to both stem rust and leaf rust, moderately resistant to loose smut, and moderately susceptible to bunt. Considerably lower than Thatcher in yield in 1939 at Brookings and Highmore. Milling and baking qualities not acceptable in Canada.

Developed from the cross, Pentad x Marquis, at the Dominion Rust Research Laboratory, Winnipeg Manitoba. Not recommended in South Dakota.

**Great Northern, C.I. No. 11937.** Also known as Newmarq believed to be same as Brandon 123. Badly mixed with Reward. Beardless, similar to Marquis. Maturity about same as Marquis. Highly resistant to stem rust, moderately susceptible to leaf rust. Considerably lower than Thatcher in yield at Brookings, in 1939.

Developed at Brandon Experiment Station in Saskatchewan.  
Not recommended in South Dakota.

**Hope, S.D. 1311, C.I. 8178.** Bearded, with smooth, white, harsh glumes. Maturity similar to Marquis, straw strong. Nearly immune from stem rust and loose smut, and resistant to leaf rust. Very resistant to bunt under South Dakota conditions. Very susceptible to black chaff and high temperatures. Decidedly inferior to Thatcher in yield and test weight. Milling and baking qualities not acceptable.

Developed from a cross of Yaroslav Emmer with Marquis, made in 1915 at the South Dakota Agricultural Experiment Station by E. S. McFadden. Later developed by him at the Highmore Experiment Substation, in cooperation with the Division of Cereal Crops and Diseases, and on his farm at Webster, South Dakota, from where it was distributed in 1927. Hope and H44, a sister selection, have been used very extensively as parents in breeding new rust-resistant varieties. Less than 3000 acres grown in South Dakota in 1939.

Not recommended as a commercial variety in South Dakota.

**Hope x Ceres, S.D. No. 1463, C.I. No. 11897.** Bearded, very similar to Ceres. Resistant to stem rust and leaf rust and moderately resistant to bunt. Loose smut reaction not definitely known but believed to be resistant. Yields somewhat less than Thatcher but some reselections appear to be about equal. Test weight superior to Thatcher. Limited tests indicate good milling and baking qualities. Needs further testing.

Developed at South Dakota Agricultural Experiment Station from Hope x Ceres cross made in 1929.

Not released or distributed.

**Komar, S.D. No. 1296, C.I. No. 8004.** Also known as 1656 wheat. Bearded, differs from Ceres in having shorter beaks, 1 to 3 mm. long, and slightly weaker straw. Slightly more resistant to stem rust than Ceres and yields slightly more under conditions of drought and high temperatures. Milling and baking qualities not as well known but probably not quite equal to Ceres.

Developed at North Dakota Agricultural Experiment Station from cross, Kota x Marquis. Distributed by the Iowa Agricultural Experiment Station in 1930 and the Colorado Agricultural Experiment Station in 1931. About 19,000 acres grown in South Dakota in 1939.

Not recommended in South Dakota because of a lack of any appreciable advantages over Ceres.

**Marquillo, S.D. No. 1308, C.I. No. 6887.** Beardless, similar to Marquis but has shorter, stiffer straw. Earlier than Marquis but slightly later than Thatcher. Resistant to stem rust, susceptible to leaf rust, and moderately susceptible to bunt. Yields less than Thatcher in South Dakota. Undesirable for flour because of yellow color in flour.

Developed through cooperation of Minnesota Agricultural Experiment Station and Division of Cereal Crops and Diseases, United States Department of Agriculture, from cross between Marquis and Iumillo durum made in 1914. Distributed in 1928. About 11,000 acres grown in South Dakota in 1939.

Not recommended in South Dakota.

**Marquis, S.D. No. 515, C.I. No. 3641.** Beardless, white smooth glumes. Formerly considered of medium maturity but now considered late in comparison with newer varieties. Susceptible to stem rust and leaf rust. Decidedly inferior in yield to Thatcher, Ceres, and other new early, rust-resistant varieties. Milling and baking qualities excellent.

Developed at the Central Experiment Farm, Ottawa, Canada from the cross, Hard Red Calcutta x Red Fife. Introduced into the United States in 1912 and 1913. Leading variety in South Dakota from 1919 to 1934 or 1935 but is rapidly disappearing because of susceptibility to stem rust, and new higher-yielding varieties. About 250,000 acres grown in South Dakota in 1939.

Not recommended in South Dakota except in those favorable locations in western portion such as Black Hills vicinity.

**Marvel, S.D. No. 1331.** Also called Overby. Bearded, similar to Preston or Velvet Chaff, susceptible to the rusts and bunt. No better than Ceres in yield and inferior in milling and baking qualities.

May be a selection from Preston or the result of a cross between Preston and Marquis.

Originated near Mellette, South Dakota. A little less than 8,000 acres grown in South Dakota in 1939.

Not recommended in South Dakota.

**Mercury, C.I. No. 11872.** Bearded, similar to Ceres. Highly resistant to stem rust, leaf rust, and bunt. Yields equal to or slightly better than Thatcher. Milling and baking qualities require further testing.

Developed at North Dakota Agricultural Experiment Station from cross, Ceres x Hope-Florence. Looks promising for South Dakota.

Not released or distributed.

**Merit, S.D. No. 1470, C.I. No. 11870.** Bearded, similar to Ceres but slightly earlier. Highly resistant to stem rust, resistant to leaf rust and bunt. Yields equal to or slightly better than Thatcher. Milling and baking qualities require further testing.

Developed by J. A. Clark of the Division of Cereal Crops and Diseases at the Federal Field Stations in North Dakota from the cross H44 x Ceres. Looks promising for South Dakota.

Not released or distributed.

**Newmarq, C.I. No. 12028.** Same as Great Northern but more free of mixtures.

**Nordhaugen, C.I. No. 11801.** Also known as Carleeds. Beardless, stiff straw. Kernels pale red and not as hard as standard varieties. About the same maturity as Thatcher. Resistant to stem rust. Susceptible to leaf rust. Yields less than Thatcher in South Dakota. Milling and baking qualities not fully determined.

Developed by Mr. C. Nordhaugen, Leeds, North Dakota. Origin unknown. Distributed in about 1937. A little less than 2000 acres grown in South Dakota in 1939.

Not recommended in South Dakota.

**Pilot, S.D. No. 1466, C.I. No. 11428.** Bearded, similar to Ceres but slightly shorter and more uniform in beak length. About same maturity as Ceres, straw slightly weaker. Resistant to stem rust, moderately resistant to leaf rust. Resistant to bunt. About equal to or slightly lower than Thatcher in yield, slightly superior in test weight. Milling and baking qualities appear to be good but require further testing.

Developed from cross, Hope x Ceres, by J. A. Clark of the Division of Cereal Crops and Diseases, United States Department of Agriculture, at the Federal Field Stations in North Dakota. Distributed in 1939. About 100 acres grown for seed in South Dakota in 1939. Promising for South Dakota.

Recommendations withheld until tested further.

**Premier, S.D. No. 1471, C.I. No. 11940.** Bearded, awns black, otherwise similar to Ceres. About as early as Thatcher, stiff straw. Highly resistant to stem rust, leaf rust, and bunt. Yields slightly less than Thatcher, very high test weight. Milling and baking tests in 1939 not very favorable but further tests necessary for definite conclusions can be drawn.

Developed from cross, Ceres-Double Cross x Ceres-Hope-Florence, at North Dakota Agricultural Experiment Station.

Not released or distributed.

**Quality, S.D. No. 1261, C.I. No. 6607.** Also known as Burbank and Florence. Beardless, white smooth glumes. Very early maturing, stiff straw. Kernels white. Very susceptible to both stem rust and leaf rust. Yields about the same as Thatcher in non-rust years but is decidedly inferior when rust is a serious factor. One of the best among the white spring wheats in milling and baking qualities.

Developed by the late Luther Burbank at Santa Rosa, California. Distributed by Burbank in 1918. Distributed in South Dakota in 1923. About 128,000 acres grown in 1939.

Not recommended in South Dakota.

**Renown, S.D. No. 1468, C.I. No. 11709.** Beardless, similar to Reward except for smooth glumes which are similar to Marquis. Maturity similar to or slightly earlier than Thatcher. Very resistant to stem rust and bunt, moderately resistant to loose smut, and moderately susceptible to leaf rust. Yields considerably lower than Thatcher, test weight higher. Milling and baking qualities acceptable except for some yellow color in flour.

Developed at the Dominion Rust Research Laboratory, Winnipeg, Manitoba, from the cross, H44 x Reward, made in 1926. Distributed in 1937. About 100 acres grown in South Dakota in 1939.

Not recommended in South Dakota.

**Renown (New) S.D. No. 1472, C.I. No. 11947.** Also known as Renown Selection. Similar to Renown except that flour color is supposed to be whiter and leaf rust resistance somewhat better.

**Reward, S.D. No. 1291, C.I. No. 8182.** Beardless, glumes white and hairy. Heads rather "ragged." Kernels hard, very plump, and dark red. Stiff straw, 3 to 5 days earlier in maturity than Thatcher. Very susceptible to stem rust but often escapes serious injury because of early maturity. Very susceptible to leaf rust and bunt, susceptible to loose smut. Yields slightly less than Thatcher in non-rust years and decidedly less in years of severe early rust. Milling and baking qualities very good.

Developed at Central Experiment Farm, Ottawa, Canada, from a cross between Marquis and Prelude. Released in 1928. Slightly over 90,000 acres grown in South Dakota in 1939.

Recommended as an early maturing variety where stem rust is not a serious hazard and where early hot, dry winds are frequently expected.

**Rival, S.D. No. 1467, C.I. No. 11708.** Bearded, similar to Ceres but slightly taller with purplish straw. Resistant to leaf rust, stem rust, and bunt. About equal or slightly superior to Thatcher in yield—slightly lower in short seasons and slightly higher in long seasons. Slightly superior in test weight. Milling and baking qualities appear to be satisfactory but require further testing.

Developed from cross, Ceres x Hope-Florence, at North Dakota Agricultural Experiment Station. Distributed in 1939. None grown commercially in South Dakota in 1939. Appears promising.

Recommendations withheld until tested further.

**Thatcher, S.D. No. 1409, C.I. No. 10003.** Beardless, similar to Marquis, but heads slightly shorter and more compact, tending to be crooked or doubled up as they emerge from boot. Kernels slightly smaller than Marquis. About 2 days earlier than Ceres and 4 to 5 days earlier than Marquis. Stiff straw. Resistant to stem rust, very susceptible to leaf rust, and moderately resistant to bunt. Yields very good but test weight is somewhat low. Milling and baking qualities very good.

Developed by the Minnesota Agricultural Experiment Station in cooperation with the Division of Cereal Crops and Diseases, United States Department of Agriculture, from the double cross, Marquis-Iumillo durum x Kanred-Marquis. Distributed in 1934. About 735,000 acres grown in South Dakota in 1939.

Recommended in South Dakota wherever black stem rust is a serious hazard.

**Vesta, S.D. No. 1469, C.I. No. 11712.** Bearded, similar to Rival except for white straw. More resistant to stem rust but more susceptible to leaf rust than Rival. Yields almost equal to Thatcher. Milling and baking qualities appear to be satisfactory but require further testing.

Origin similar to that of Rival.

Not released or distributed.

### **Durum Wheat Varieties**

**Acme, S.D. No. 284, C.I. No. 5284.** Yellow straw and rather small kernels. Very resistant to stem rust and leaf rust. Yields satisfactorily but quality is not considered acceptable by millers.

Originated as a selection from Kubanka made at the Highmore Experiment Substation in 1909. Grown commercially in 1916. Slightly less than 2000 acres grown in South Dakota in 1939.

Not recommended in South Dakota.

**Arnautka, S.D. No. 1001, C.I. No. 4064.** Also called Goose and Wild Goose. Yellow smooth glumes, yellow awns, large amber kernels, and tall midstrong straw. Moderately

resistant to stem rust. Yields similar to Mindum, slightly lower at Brookings and slightly higher at Highmore. Quality good but pure seed difficult to obtain.

Believed to have been introduced into North Dakota by Russian immigrants.  
Recommended in central districts of South Dakota.

**Golden Ball, S.D. No. 1187, C.I. No. 6227.** Also called Solid Stem. White, hairy glumes, white stems and black awns. Kernels amber, long. Good rust resistance and drought resistance, nearly immune from most strains of bunt. Yields about equal to Mindum, quality usually considered inferior.

Introduced from Johannesburg, South Africa, in 1918 by United States Department of Agriculture. Slightly over 25,000 acres grown in South Dakota in 1939.

Not recommended in South Dakota.

**Kubanka, S.D. No. 75, C.I. No. 1440.** Smooth yellowish glumes, yellowish awns, and large amber kernels. Moderately resistant to stem rust. Yields slightly lower than Mindum. Quality excellent but pure seed difficult to obtain.

Introduced from Russia in 1900 by M. A. Carleton of the United States Department of Agriculture.

Recommended in central districts of South Dakota.

**Mindum, S.D. No. 1160, C.I. No. 5296.** Similar in appearance to Arnautka. Moderately resistant to stem rust. Yields uniformly good in tests throughout South Dakota. Quality excellent for seminola products but somewhat inferior to Kubanka and Arnautka for bread-making.

Selected from a mixture of durum wheat found in a field of common wheat at the Minnesota Agricultural Experiment Station in 1896. Distributed in 1917. About 35,000 acres grown in South Dakota in 1939.

Recommended for all districts where durum wheat is grown in South Dakota.

**Nodak, S.D. No. 1266, C.I. No. 6519.** Similar to Kubanka but somewhat inferior in quality.

Selected from Kubanka at the North Dakota Agricultural Experiment Station in 1915. Distributed in 1923. About 2,500 acres grown in South Dakota in 1939.

Not recommended in South Dakota.

**Peliss, S.D. No. 1256.** Also called Black Bearded. Heads large, thick compact with long, stiff, black awns and almost white chaff. Moderately susceptible to stem rust. Yields lower than Mindum.

Introduced from Algeria in 1900 by United States Department of Agriculture. About 11,000 acres grown in South Dakota in 1939.

Not recommended in South Dakota.

**Pentad, S.D. No. 1414, C.I. 3322.** Commonly known as Red Durum. Glumes and awns nearly white, Kernels dull red in color. Highly resistant to stem rust and leaf rust. Yields slightly lower than Mindum except in hot dry seasons when it appears to perform slightly better. Quality not acceptable to millers.

Introduced in 1903 by H. L. Bolley of the North Dakota Agricultural Experiment Station. Distributed in 1911. About 258,000 acres grown in South Dakota in 1939.

Not recommended as a milling variety in South Dakota.

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