

Wheat Varieties of Importance in N. Dak.¹

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IN the November issue of the Bimonthly the comparative yields of the more important varieties of wheat, as obtained in the regular variety tests at North Dakota stations in 1940, were reported. It was pointed out that due to late drouth, the differences between varieties in time of maturity were important factors influencing yield differences in some parts of the state, the early varieties being favored. Because certain environmental conditions may have an unusually large influence on yields in some seasons, safe conclusions about varieties, and their relative capacities for yield, cannot be drawn from one year's observations. In the accompanying tables are recorded the performance of leading and promising new varieties for the longer period for which data are available.

Many of the varieties now claiming attention have been tested in the field plots since 1936. All of these have from fair to a high degree of resistance to stem rust, and some also have resistance to leaf rust. Resistance to these, and other diseases, are large factors influencing yield differences in some years, though not always. In 1936 drouth and heat, throughout much of the growing season, were the factors limiting production. All varieties were seriously injured and differences in yield were not large. In 1937 stem rust was severe in about two-thirds of the state and in 1938 both stem and leaf rust influenced variety yield differences. Stem rust injury on durum was less serious than in some of the hard red spring wheats, though the infection in late fields was often heavy. Stem rust was not present to any appreciable extent in 1939 but some early and some late drouth tended to reduce yield differences.

Resistance to rust is not immunity and, as the term is usually used, it means resistance to those rust strains generally present. Other diseases not now regarded seriously may increase and become a larger factor in variety preferences in the future. Head blight infections were common in the durum area in 1940. There are several organisms that may cause head blight. Some of these organisms may also cause

seedling blight. Hard red spring wheats appear less susceptible, or being earlier tend to escape damage better than the durums. It is doubtful, however, if any of the varieties of durum now grown have any particular resistance to these blights. Drouth resistance is not well understood, and what may appear like differences in resistance may often be largely due to escape from damage owing to earliness. Certain wheats, like the durums, appear to be readily injured in some stage of their development, such as at time of seed-setting, due to pollen injury, yet in some other stages may show relatively satisfactory tolerance to drouth conditions.

Milling tests measure differences in yield of flour and the ease with which the milling operations and flour separations are made. Flour quality among hard red spring wheats is measured by the baking test and is made up of a number of factors. Loaf volume is one of these factors and is a measure of relative gluten strength. It is considered of first importance and can be measured quantitatively. In varieties of good flour quality, large loaf volume is closely correlated with high protein content, but there are varieties high in protein content that have a low quality of gluten. Other factors used to indicate good flour quality are high water absorption, a relatively short dough

¹ Trials at Langdon and Dickinson in cooperation with, and at Mandan under the supervision of the Division of Cereal Crops and Diseases, U. S. Dept. of Agriculture.

development time with a long fermentation tolerance and ability of the dough to withstand high speed mixing. The resultant loaf to be most desirable should possess a creamy white crumb color together with a good texture. Environmental conditions under which the wheat is grown will influence the quality of the flour. In some years unfavorable conditions may adversely affect some varieties more than others.

Thatcher—Standard Hard Red Spring

Thatcher is the most widely grown of the varieties of hard red spring wheat now available, and is

used as the standard to which newer varieties are compared. This wheat yielded especially well in 1940, giving general satisfaction over nearly the entire state. Thatcher has good resistance to stem rust; is satisfactory in resistance to loose smut; rather susceptible to leaf rust and moderately susceptible to stinking smut. The variety is recognized as an excellent milling wheat and in flour quality, as indicated by loaf volume and protein content, is superior to older standard varieties like Marquis and Ceres. The strong gluten in the flour makes Thatcher not only desirable for itself but also for use in blending with other weaker flours.

A COMPARISON OF THE AVERAGE YIELDS OF SEVERAL HARD RED SPRING WHEAT VARIETIES AND MINDUM DURUM FOR THE YEARS GROWN AT 6 NORTH DAKOTA STATIONS.

	Fargo 1936-40	Langdon 1936-40	Edgeley 1939-40	Dickinson 1935-40 ^a	Mandan 1937-40	Williston 1938-40	Weighted average 24 comparisons
Thatcher	23.3	17.9	6.8	12.5	16.8	14.5	16.4
Nordhogen..	22.6	18.0	6.1	12.1 ^b	15.5	14.3	15.9
Renown ^c	21.4	17.6	5.4	9.7 ^d	12.5	13.1	14.3
Rival	24.6	20.0	7.1	13.3	17.4	13.7	17.3
Pilot	23.0	20.8	8.3	12.6	15.9	14.0	16.8
Vesta	24.2	21.5	9.1	.....	17.8	.....	.....
Ceres	19.4	10.8	8.7 ^b	10.6	12.7	13.7	13.1
Marquis	15.4	8.6	.....	8.8	11.6	.....	.....
Mindum	22.1	16.7	5.1	10.3	14.6	.....	.....

^a 1936 omitted—crop failure.

^b Not grown one year and yield for Thatcher substituted.

^c New Renown (R.L. 716.6) in 1940.

^d Not grown in 1935—used yield for Reward.

NORDHOUGEN has been tested since 1936. During that time it has shown about the same capacity for yield as Thatcher. The variety has about the same degree of resistance to stem rust as Thatcher and slightly more resistance to leaf rust. This beardless variety grows a little taller and ripens about the same time as Thatcher. The kernels which have sometimes been described as semi-hard in texture, are larger than Thatcher and usually have a lower test weight. In ease of milling, flour yield and color, Nordhogen is satisfactory, but in gluten strength the flour rates about average or below Thatcher. In the terminal markets this wheat is finding its largest outlet in mills which desire it for blending purposes.

RIVAL was first released in 1939. A fair acreage of this variety can be expected in 1941. Rival is mod-

erately resistant to stem rust and when considerable rust is present will show a heavier infection than Thatcher. Rival is more resistant to leaf rust than Thatcher and appears to have some resistance to both loose and stinking smut. During the 5 years tested at Fargo, Rival yielded the same as Thatcher in 1936 and 1939, slightly less than Thatcher in 1940 and more than Thatcher in 1937 and 1938, averaging for the 5 years 24.6 bushels against 23.3 bushels for Thatcher. Rival yielded better than Thatcher in 4 out of 6 years at Langdon; as well or better in 3 out of 5 years at Dickinson and in 3 out of 4 years at Mandan. Rival wheat is bearded, grows taller than Thatcher and the straw is moderately strong, but not as strong as that of Thatcher. In time of heading and ripening Rival is compara-

ble to Ceres, being 1 to 3 days later than Thatcher. Rival usually has a higher bushel weight than Thatcher, the kernals are larger and there is a tendency to shatter in some years. This tendency to shatter presumably will make it less desirable for straight combining than Thatcher. In flour qualities, Rival ranked close to Thatcher in 1937 and 1938, slightly below Thatcher in 1939 and 1940, though it was equal or superior to Marquis and Ceres in these years. Rival is usually high in flour yield and the loaf has a good crumb color.

PILOT was first released in 1939. This bearded variety is moderately resistant to stem rust, but not equal to Thatcher in this respect. Pilot is more resistant to leaf rust and to stinking smut than Thatcher, but less resistant to loose smut. Pilot grows taller, has a weaker straw, and is later in ripening than Thatcher or Ceres. The kernels of Pilot are larger and more tapering than those of Thatcher, and the heads do not shatter readily. The grain is about equal to Thatcher in test weight, both usually running low.

Comparing the yields during the last 8 years at Fargo, Pilot has averaged about the same as Thatcher. Pilot outyielded Thatcher in 1934, 1938 and 1939, but yielded less than

Thatcher in four of the other years grown. At Langdon Pilot yielded as well or better than Thatcher in all years but 1939. For the 8-year period tested, Pilot averaged 20.4 and Thatcher 18.5 bushels. For the same years at Dickinson, Pilot yielded as well or better than Thatcher in 6 out of 7 years and averaged 11.0 bushels against 10.5 bushels for Thatcher. At Mandan, since 1934,¹ Pilot averaged for the 6-year period 15.6 bushels and Thatcher 16.4 bushels, Pilot being equal or superior in yield in 3 out of the 6 years. Pilot is regarded as satisfactory in milling and baking qualities, ranking close to Thatcher in most respects.

RENOWN is a beardless, rust resistant wheat first distributed in Canada in 1937. This variety has been grown in the field plots since 1936. Renown is slightly more resistant to stem rust, and distinctly more resistant to leaf rust than Thatcher, ripens about the same time or a little later than Thatcher, and grows slightly taller. Renown is moderately resistant to bunt, the kernels are larger than those of Thatcher and have excellent color. The grain is usually of high test weight and pleasing appearance.

Since 1936 yields of Renown have averaged 21.4 bushels per acre or about 2 bushels less than Thatcher

HOW VARIETIES HAVE COMPARED IN YIELD WITH THATCHER IN NORTH DAKOTA Summary of all field plat trials.

Variety	Av. yield ¹	Av. yield Thatcher same years	In % of Thatcher	No. of comparative tests	No. of years and when grown	
					No.	Years
Ceres	17.1	18.8	91	56	11	1930-40
Marquis	14.4	19.3	75	52	11	do
Pilot	17.0	16.7	102	35	8	1933-40
Rival	17.3	16.5	105	26	5	1935-40
Nordhousen	15.8	16.5	96	24	5	1936-40
Renown	14.2	16.5	86	24	5	do
Vesta	18.7	16.7	112	21	5	1936-40
Brandon 123	15.3	17.4	88	13	3	1938-40
Apex	18.7	20.7	90	10	3	1937-39
Coronation	26.1	24.8	105	4	4	1934-5-8-9
Regent	18.2	20.3	90	4	2	1939-40
Merit	17.8	16.7	107	15	3	1938-40
Premier	18.4	17.0	108	15	3	1938-40
Mindum	16.8	18.8	89	53	11	1930-40
Kubanka	17.5	19.2	91	51	11	do
Red Durum	19.4	20.1	97	27	11	do
K 75	19.4	22.4	87	16	10	1930-39

¹ These average yields are comparable only to the Thatcher yields in the next column, and are not comparable with one another. The figures in the third column express the average yield in percent of the Thatcher yield.

² Excluding 1936 when trials failed due to drouth.

at Fargo. Only in 1938, when there was much leaf rust, did Renown equal Thatcher in yield at this station. Renown yields were better than Thatcher in 1937 and 1938 at Langdon, but in the other 3 years tested, Thatcher outyielded Renown, and averaged 17.9 against 17.6 bushels for Renown for the 5-year period. Results at Dickinson, Mandan, and other miscellaneous trials, show that Renown has consistently yielded below Thatcher, indicating an inherent lower capacity for yield.

From milling and baking tests made, Renown is regarded satisfactory in flour yield, protein content and baking strength. The flour, however, has an excess of yellow pigment and the bread has inferior crumb color. A selection of Renown (R. L. 716.6) having less of this objectionable flour color has recently been released in Canada. The results reported here for 1940 are from this selection.

APEX was developed at the University of Saskatchewan and released first in 1937. Apex is beardless, about as resistant to stem rust as Thatcher and more resistant to leaf rust, and to stinking smut. It is more susceptible to loose smut than Thatcher. Apex is from 2 to 4 days later in ripening than Thatcher and from 1 to 2 days later than Ceres. This variety grows about as tall as Thatcher and has a weaker straw. The kernel of Apex is quite similar to that of Marquis in appearance.

In nearly all of the yield comparisons made with Apex in North Dakota, the results obtained have favored Thatcher over Apex. This may be due in part to the differences in time of ripening—the later ripening date of Apex usually being unfavorable under late drouth conditions. The flour quality of Apex may be regarded as acceptable though not equal to Thatcher and other high quality wheats—usually rating below them in protein content and baking strength. Apex is grown to only a small extent in North Dakota.

BRANDON 123 originated at the Brandon Experimental Farm, Brandon, Manitoba, and is a beardless selection from a cross between Marquis and Hope. This wheat has not been licensed for distribution in Canada. It is considered there as

below standard in flour quality and as having no unusual merit from the standpoint of yield or stem rust resistance when compared with other rust resistant varieties. Grown in the trials at Fargo since 1938, Brandon 123 yielded about the same as Thatcher in 1938 but less than Thatcher the last 2 years. Somewhat similar results were obtained at Langdon, Brandon 123 outyielding Thatcher only in 1938. Grown at Mandan in 1938 and 1939, Brandon 123 failed to equal Thatcher in yield in either year, and was discontinued.

Brandon 123 compares favorably with Thatcher, Renown, Apex and Nordhogen in resistance to stem rust and is more resistant to leaf rust than Thatcher. The variety grows taller and requires from 3 to 4 days longer to ripen than Thatcher. Brandon 123 is considered inferior to Thatcher in flour quality. Great Northern and Newmarq are other names for the same wheat.

REGENT is a beardless variety developed at the Dominion Rust Research Laboratory, Winnipeg, from a cross between Reward and H-44 and was first released to Canadian growers in 1939. A few North Dakota farmers also obtained small lots of this seed in 1939.

Regent is slightly more resistant to stem rust than Thatcher and is superior to this wheat in resistance to leaf rust and stinking smut. Regent ripens about the same time as Thatcher and Renown. The grain usually has better color than Thatcher but so far has not shown any superiority in test weight in the North Dakota trials. Yield comparisons cover only 2 years. From these limited observations and some nursery comparisons for 1938, one cannot see any superiority in yield for Regent over Thatcher; in fact differences noted so far have been in favor of Thatcher. Regent, however, appears superior to Renown in yield and in Canada is regarded satisfactory in baking strength and superior to Renown in flour color.

OTHERS—Marquillo is satisfactory in resistance to rust but is inferior to Thatcher in capacity for yield and is not satisfactory in baking quality, chiefly because of the poor crumb color of the loaf. Hope is one of the most rust resistant

varieties of hard red spring wheat available, but does not yield well, and the flour is inferior in baking quality. While these wheats have been in production for a considerable number of years, they have never found much favor with growers.

Premier, Merit and Vesta are experimental varieties not yet released for commercial production. These have been developed thru hybrid-

ization and selection—selecting for lines having a high degree of rust resistance. Vesta is resistant to stem rust, yields very well but lacks resistance to leaf rust. Premier and Merit are resistant to both stem and leaf rust. Extensive flour tests on the 1940 crop, now nearing completion, is expected to determine whether any of these are satisfactory in flour quality. The results of these tests will be announced as soon as they are completed.

HOW VARIETIES HAVE COMPARED WITH THATCHER IN TEST WEIGHT WHEN GROWN UNDER COMPARABLE CONDITIONS IN NORTH DAKOTA
Summary of all field plat trials.

Variety	Av. test wt. ¹	Av. test wt. Thatcher same years	No. of comparative tests	No. of years and when grown	
				No.	Years
Ceres	56.7	56.6	56	11	1930-40
Marquis	55.0	56.9	52	11	1930-40
Pilot	56.4	56.5	35	8	1933-40
Rival	57.3	56.1	26	5	1935-40
Nordhougen	55.3	56.5	24	5	1936-40
Renown	57.0	56.5	24	5	1936-40
Vesta	58.3	56.3	21	5	1936-40
Brandon 123	55.4	56.6	13	3	1938-40
Apex	58.0	57.5	10	3	1937-39
Coronation	56.6	56.5	4	4	1934-5-8-9
Regent	56.6	57.5	4	2	1939-40
Merit	56.9	57.0	15	3	1938-40
Premier	58.2	56.4	15	3	1938-40
Mindum	59.7	56.8	52	11	1930-40
Kubanka	59.0	56.8	50	11	1930-40
Red Durum	59.5	56.7	27	11	1930-40
K 75	58.2	56.9	16	10	1930-39

¹These average test weights are comparable only to Thatcher weights in the second column, and are not comparable with one another.

Durum Wheat

For many years durum has been grown most successfully in the northeastern counties of the state, outside of the Red River Valley. The durum wheats as a class are moderately resistant to stem rust, also to leaf rust, and this, in part at least, has accounted for the relatively greater success and popularity of durum in that area. Durums have a larger capacity for yield than the common wheats, when conditions are favorable, but when conditions are not favorable, as in the drier sections of the state, the earlier ripening common wheats will usually yield as well or better. Some of the newer varieties of hard red spring wheat now available are even more resistant to stem rust than the durums. This tends to reduce the advantage which the durums have had in what is recognized as the best durum area.

Mindum is the variety of durum most extensively grown. Mindum is moderately resistant to stem rust, has high yield when grown under reasonably favorable conditions, and the grain has good amber color producing excellent quality semolina. Kubanka is more variable than Mindum both in resistance to rust and quality of grain. Many lines have been selected out of Kubanka and some of these have shown higher rust resistance than the parent variety. Unfortunately, however, nearly all of these resistant lines have proven to be below standard in semolina quality. K-75 represents a type of Kubanka which has been grown rather extensively in some localities and is recognized as producing a high quality semolina.

OTHER varieties of durum may produce satisfactory or even better yields but have a smaller market demand. Golden Ball, identified also as Solid Stem and Viking, at-

tracts attention in the field. The heads are compact and blocky with hairy chaff and black beards. This variety has a more pithy stem than other durum. The kernels are large but often lack the bright amber color of Mindum. At Fargo, Mindum yielded as much or more than Golden Ball in 6 out of 7 years and averaged 26.2 against 23.5 bushels for Golden Ball. At Langdon for the 9 years grown, Mindum yielded as much or more in 5 of the years. Golden Ball stood the rust

better and yielded better than Mindum in 1935 and 1938, and for the 9 years averaged 1.1 bushels better than Mindum.

The quality of the semolina produced by Golden Ball is not regarded satisfactory by the macaroni manufacturers and very little of this wheat is used for that purpose. There is a limited market for choice lots of this variety, also for other lots of large kernalled amber durum, for making puffed wheat, but the principal outlet for Golden Ball appears to be in the feed market.

HOW THE MOST COMMONLY GROWN VARIETIES OF DURUM HAVE COMPARED
IN YIELD WITH MINDUM
Summary of all field plat trials.

Variety	Av. yield ¹	Av. yield Mindum same years	In % of Mindum	No. of comparative tests	No. of years and when grown	
					No.	Years
Kubanka	19.7	19.9	99	87	19	1921-39
Monad (D-1)	22.9	21.8	105	69	19	1921-39
Red Durum (D-5)	21.0	20.6	102	49	20	1921-40
K 75	19.4	21.2	92	16	10	1930-39
Golden Ball	20.6	21.2	97	16	9	1931-39

¹ These average yields are comparable only to the Mindum yields in the next column, and are not comparable with one another. The figures in the 3rd column express the average yield in percent of the Mindum yield.

Monad (D-1) is one of the most rust resistant amber durums available. It ripens a little earlier and has a weaker straw than Mindum. Monad yields very satisfactorily, but unfortunately does not produce high grade semolina. Monad and Acme are very similar in plant characters, rust resistance and semolina quality. Red durum (D-5) is the most rust resistant durum; ripens a little earlier than Mindum, does not grow as tall and has a weaker straw. The chaff is white, the kernel has a dull red color, pointed germ end with a blunt or square brush end. Red durum is not considered satisfactory for making macaroni products. The outlet for this wheat on the market appears to be mainly commercial feed channels. It is the preferred wheat in the mixed poultry feeds.

Summary

No one variety is superior to other varieties in all respects. Of the varieties now available, Thatcher may be considered as being the variety most preferred. Thatcher resists stem rust satisfactorily, is high in flour quality, and is widely

grown so seed is easily available. If Nordhougen is chosen it would be because of a desire for a beardless variety that grows taller than Thatcher. Preference for Ceres would be limited to areas where the hazards of stem rust are small. Growers who have preference for a wheat of high test weight, especially for its good color and kernel appearance may find Renown more to their liking.

Rival and Pilot have been released more recently and for the present should be regarded primarily as supplementing Thatcher and other varieties. In the next year or two these will be more widely grown, permitting extensive observations that will indicate more clearly their probable place in our farm production.

Mindum is usually the first choice among the durum growers. Good strains of Kubanka are satisfactory and preferred in some communities. Red durum offers the best protection against stem rust, but since it is not suitable for making macaroni products, the outlet for this wheat is limited to feed channels.