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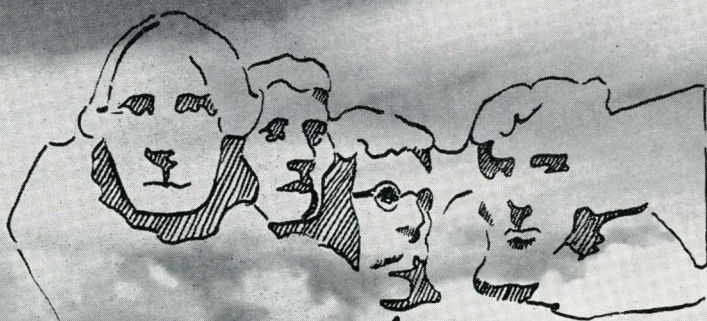
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Rushmore

SPRING WHEAT



AGRONOMY DEPARTMENT

Agricultural Experiment Station

SOUTH DAKOTA STATE COLLEGE - BROOKINGS

RUSHMORE SPRING WHEAT

By J. E. GRAFIUS and V. A. DIRKS¹

Earliness, stiff-straw, resistance to shattering, superior quality and good yield are some of the reasons for the release of Rushmore spring wheat. The agronomic and plant pathological measurements taken indicate that this variety combines the good points of the standard varieties, Pilot, Rival and Mida, and minimizes many of their undesirable qualities under South Dakota environment.

About 4,800 bushels of this variety were released by the South Dakota Agricultural Experiment Station to the County Crop Improvement Associations in the spring of 1949.

History

Rushmore was derived from the cross of Rival x Thatcher made at the South Dakota Agricultural Experiment Station in 1937². Previous to naming, Rushmore was designated by R. x T. 2280, C.I. 12273. The cross was made with the intention of combining the drouth resistance and earliness of the Thatcher parent with the high yield and resistance to leaf rust, *Puccinia rubigo-vera tritici* (Eriks.) Carleton, of the Rival parent. To a large measure these objectives were accomplished. However, due to the occurrence of new leaf rust races, the leaf rust resistance of the standard varieties is no longer satisfactory and Rushmore shows no improvement in this respect.

Rushmore has undergone extensive performance testing in South Dakota over a period of 8 years, with a total of 27 replicated rod-row and drill strip tests. In addition, it has been tested in neighboring states so that information is available to farmers in adjacent areas. Farmers in other states should contact their experiment stations for recommendations before purchasing seed of this variety.

Milling and baking quality determinations have been conducted by several laboratories. The U. S. D. A. laboratory at Beltsville, Maryland has information from 21 locations over a 6-year period. These data are reported in the test under the Milling and Baking section.

Plant and Seed Characteristics

Rushmore is an early, beardless, stiff-strawed variety very similar to Thatcher in appearance (Fig. 1). In respect to the beardless plant type, it should be stated that the lot of seed released had some bearded segregates. The original increase was progeny "rowed" to eliminate these variates, but in spite of this precaution, the bearded segregates persist.

¹Agronomist and Assistant Agronomist, respectively.

²Cross made by S. P. Swenson, formerly Associate Agronomist. Testing work and final selection completed by Senior Author. Junior Author assumed charge of spring wheat breeding program in 1947.

Table 1. Average plant and seed characteristics of Rushmore, Rival, Pilot Mida and Thatcher grown at Brookings, 1944—1948.

Variety	Date headed	Lodging resistance	Ht. in.	Test Wt. lbs./bu.	Stem rust resistance	Leaf rust resistance	Loose smut resistance	Shattering resistance
Rushmore	6/25	R*	35	57.3†	MR	MS	MR	R
Rival	6/28	MR	39	56.4	MR	MS	MR	S
Pilot	6/28	MS	39	54.4	MR	MS	MR	R
Mida	6/27	MR	39	56.7	MR	MS	S	MS
Thatcher	6/25	R	35	54.8	MR	S	MR	R

*R—resistant, S—susceptible, MR—moderately resistant, MS—moderately susceptible.

†The data on test weight should be qualified to the effect that under favorable conditions, Mida will usually rank first.



Figure 1. Comparison of heads of Rushmore (left) and heads of Thatcher.

The seeds of Rushmore tend to be short and blocky, as contrasted to the longer, more slender kernels of Pilot (Fig. 2). Seed and plant characteristics of Rushmore may be described best by comparing it with known varieties as shown in Table 1.

Under South Dakota conditions, Rushmore equals or exceeds the other four varieties for seven of the eight characteristics listed (Table 1). No attempts have been made to evaluate the eighth characteristic, height, as all varieties are within an acceptable height range.

No data for drought resistance are available, aside from the yield observations at the Cottonwood and Highmore Field Stations. These data indicate that Rushmore is equal to the Thatcher parent in this respect.

Frequently, the success or failure of a variety may be attributed to one or more characteristics, regardless of its yield under

optimum conditions. For example, in South Dakota a variety must be early maturing to escape the hazards of heat, drought and grasshoppers. A late maturing variety which may produce excellent yields in the absence of these hazards is, nevertheless, a liability if it fails to produce under moderate drought conditions. Likewise, a single crop failure due to shattering or the inconvenience of a severely lodged crop, is sufficient to cause a shift in varieties. Such factors, also, as premiums for high test weight or the loss of yield due to loose smut, *Ustilago tritici* (Pers.) Rostr., are not inconsequential to the popularity of a variety.

Resistance to stem rust, *Puccinia graminis tritici* Eriks. and Henn., and to leaf rust are requisite to any spring wheat variety in this area. As previously stated, the field resistance to leaf rust of the standard

Table 2. Five year average yields in bushels per acre of Rushmore compared with four standard varieties grown at the South Dakota Agricultural Experiment Station (Brookings) and at the Highmore, Eureka and Cottonwood Field Stations for the years 1944-48.

Variety	Brookings	Highmore ¹	Eureka	Cottonwood
Rushmore	30.9	24.9	20.0	16.5
Rival	29.8	20.4	19.6	15.9
Pilot	28.5	22.9	19.6	15.0
Mida	28.2	24.4	21.4	14.1
Thatcher	25.4	22.9	17.7	15.3
L.S.D. ²	1.4	1.7	2.8	1.9

¹Five year average based on years 1943-1948, as 1946 crop was destroyed by hail.

²Least significant difference.

varieties and of Rushmore is no longer sufficient, and improvement in this respect may be expected in varieties of the future.

Yield Data

The average yields for a five year period are presented in Table 2.

It will be observed that the average yields of Rushmore compare favorably with the yields of the standard varieties. The yields of Rushmore were not statistically greater

than the best standard variety at any location, but it ranked first in average yield at three of four locations and second in average yield at Eureka. However, average yields do not tell the complete story. In order to avoid choice of varieties that fluctuate greatly in yield order on a yearly basis, it is necessary to examine the data from which the 5-year averages were calculated (Table 3).



Figure 2. Contrast of seeds of Rushmore (left) and seeds of Pilot.

Table 3. The stability of yield of Rushmore, Pilot, Rival and Mida in respect to Thatcher. Data from the South Dakota Agricultural Experiment Station (Brookings) and from the Highmore, Eureka and Cottonwood Field Stations for the years 1944-48.

Station and Variety	1944	1945	Years			Total Years		5 yr. av. ²
			1946	1947	1948	above	below	
Brookings								
Rushmore	0 ¹	+	0	+	0	2	0	+
Pilot	0	+	0	+	0	2	0	+
Rival	0	+	+	+	0	3	0	+
Mida	0	+	—	+	—	2	2	+
Thatcher	0	0	0	0	0	0	0	0
Highmore								
Rushmore	+	+	*	0	0	2	0	+
Pilot	0	0	*	0	0	0	0	0
Rival	+	0	*	0	—	0	1	0
Mida	+	+	*	0	0	2	0	0
Thatcher	0	0	*	0	0	0	0	0
Eureka								
Rushmore	0	0	0	0	0	0	0	0
Pilot	0	0	+	0	+	2	0	0
Rival	0	0	+	0	0	1	0	0
Mida	0	0	0	0	+	1	0	+
Thatcher	0	0	0	0	0	0	0	0
Cottonwood								
Rushmore	0	0	0	0	0	0	0	0
Pilot	—	+	0	0	0	1	1	0
Rival	0	0	0	0	0	0	0	0
Mida	0	0	0	0	0	0	0	0
Thatcher	0	0	0	0	0	0	0	0

¹0=No statistically significant increase over Thatcher; += a significant increase; —=significant decrease.

²Data from Table 2.

³Destroyed by hail.

It will be concluded from Table 3, that the yields of Rushmore have been consistently good when compared with Thatcher and that in no case was the yield of Rushmore less than that of Thatcher. It will also be noted that the other three varieties (Pilot, Rival and Mida) had at least one year at one location, in which the yields were significantly less than Thatcher.

These conclusions, together with the average yields given in Table 2, indicate that Rushmore is satisfactory from the yield standpoint, and that it is best adapted to the eastern, central and western areas of South Dakota. The average yield at Eureka (North Central Area) was lower than that of Mida, and the use of Rushmore in this area should be based more on agrono-

Table 4. Average milling and baking data in percent of Thatcher for the years 1941-47.¹

Variety	Wheat protein	Flour yield	Water absorption	Optimum loaf volume	Crumb color	Grain texture	Ash content
Rushmore	102.7	102.2	100.6	100.6	101.9	102.3	95.7
Pilot	98.1	98.8	98.7	100.0	104.2	101.6	95.3
Rival	100.5	102.6	103.4	100.7	104.4	101.7	104.7
Mida	100.8	102.5	100.6	96.8	107.4	101.8	95.8
Thatcher	100.0	100.0	100.0	100.0	100.0	100.0	100.0

¹Data from "Milling, baking and chemical experiments with hard red spring wheat, 1947 Crop," by C. C. Fifield, *et al.*, United States Department of Agriculture Research Publication, September, 1948.

mic and plant pathological characteristics such as resistance to shattering and loose smut than on yield (Table 1).

Milling and Baking

Milling and baking data from Rushmore, based on a 6-year average and 21 tests, are shown in Table 4. These data are in percent of Thatcher, an accepted standard for high quality hard red spring wheat. Comparisons of Rushmore with varieties other than Thatcher are not strictly valid, as a larger number of tests were included in the averages for other varieties.

For the 6-year period, Rushmore exceeded Thatcher in protein of wheat, yield of flour, water absorption, loaf volume of optimum bake, crumb color and grain-texture of bread. It was lower than Thatcher in flour

ash and thus shows an improvement in this respect.

Additional laboratory milling and baking tests by industry have indicated that Rushmore is satisfactory in milling and baking qualities.

Summary

About 4,800 bushels of Rushmore (Rival x Thatcher 2280, C.I. 12273) were released to the Crop Improvement Associations by the South Dakota Agricultural Experiment Station in the spring of 1949.

Because this variety is early, stiff-strawed and resistant to shattering, it is expected to have an important place in the agriculture of South Dakota. Yielding ability and milling and baking quality were shown to be satisfactory under South Dakota conditions.