ROUGHRIDER . . . A Winterhardy, High Yielding Hard Red Winter Wheat Variety

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Roughrider (CI 17439) is a new variety of hard red winter wheat developed and released December 18, 1975, by the North Dakota Agricultural Experiment Station. It is the first winter wheat variety ever released by North Dakota.

Roughrider is higher yielding and more lodging resistant than either Froid or Winoka, the two most popular winter wheat varieties in North Dakota. It is heavier in test weight, earlier maturing and shorter than Froid. Its winterhardiness is similar to Froid and superior to Winoka. The name "Roughrider" was taken from the association with President Theodore Roosevelt, who ranched in western North Dakota where this variety is well adapted.

Agronomic Performance

Roughrider has been evaluated in trials in North Dakota since 1970. Data from advanced yield trials for 1973-1975 are presented in Tables 1 and 2. Table 1 is a comparison of grain yields at individual experiment stations. Roughrider was the highest yielding variety at Hettinger, Minot and Dickinson, while Centurk was highest at Casselton, Williston and Mandan. When averaged over all locations, Roughrider outyielded Centurk and Winoka by about 9 per cent, Sundance by about 10 per cent, Froid by about 11 per cent and Bronze by about 15 per cent.

Dr. Erickson inspects Roughrider in field test plots.

Other agronomic traits are compared in Table 2. The winterhardiness of Roughrider, as measured by per cent survival, is equivalent to Froid and Sundance, and superior to Winoka, Bronze and Centurk. The test weight of Roughrider is much better than Froid and Sundance, better than Centurk and Bronze, but not quite as good as Winoka. Roughrider heads earlier and is shorter than Sundance and Froid, similar to Winoka and is taller and later than Centurk and Bronze. Roughrider is more lodging resistant than Froid, Winoka and Sundance, while similar to Bronze and Centurk.

Disease Resistance

Roughrider has been resistant to stem rust strains prevalent in North Dakota. Its stem rust reaction to race 15B is similar to Froid and Winoka; however, Roughrider has a higher level of resistance to races 56 and 151 than either of the other two varieties in greenhouse seedling tests (Table 3). Adult greenhouse plants of Roughrider have shown good resistance to prevalent races 15B and 151 and non-prevalent race 56, except mixed with some susceptible plants to race 15B. Roughrider's susceptible reaction to leaf rust was similar to Froid and Winoka.

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Table 1. Grain yields, bu/A, of six winter wheats grown in North Dakota in 1973-75.

Variety	Casselton	Hettinger	Minot	Williston	Dickinson	Mandan	Mean	% Froid
No. of tests	2	3	2	4	2	1	14	14
Roughrider	42.3	29.8	61.6	34.3	39.0	34.2	38.8	110.9
Froid	38.2	25.1	51.9	32.8	34.6	36.7	35.0	100.0
Winoka	44.7	27.6	47.1	34.0	36.9	28.4	35.7	102.0
Centurk	45.3	28.9	46.4	34.7	32.7	38.8	35.8	102.3
Sundance	42.7	24.4	49.6	33.4	38.0	35.7	35.5	101.4
Bronze	38.5	26.3	41.3	31.7	34.2	34.8	33.5	95.7

Table 2. Performance of six winter wheats grown in North Dakota in 1973-75.

	Station years	Roughrider	Froid	Winoka	Centurk	Sundance	Bronze
Agronomic							
Yield, bu/A	14	38.8	35.0	35.7	35.8	35.5	33.5
Survival, %	7	69.1	67.1	58.7	28.4	67.0	49.0
Test wt., lb/bu	14	59.7	57.2	60.1	58.2	55.1	58.6
Head date, June	12	19.5	21.3	19.6	18.5	24.7	17.8
Height, in.	11	35.8	39.1	36.0	32.8	37.7	34.8
Lodging, 0-9	5	1.5	2.3	2.2	1.3	2.0	1.4
Disease							
Stem rust		Res.	Res.	Res.	Res.	Susc.	Res.
Leaf rust		Susc.	Susc.	Susc.	Susc.	Susc.	Susc.

Milling and Baking Quality

The milling, baking and rheological (physical dough) properties of Roughrider compared to Froid and Winoka are presented in Tables 4 and 5. The data are from 6 to 8-pound samples obtained from field plots grown at the various experiment stations in North Dakota. Data for two major grading factors, test weight and percentage of vitreous kernels, show that Roughrider has much better test weight than Froid, but not quite as heavy as Winoka. The vitreous kernel content of Roughrider and Froid is similar and higher than that for Winoka.

Protein content is of importance from both a nutritional and baking quality standpoint. The wheat and flour protein contents of Roughrider and Froid are similar and superior to those of Winoka. The difference between wheat and flour protein contents of 0.8 per cent was the same for all three varieties. These protein contents are about 1.0 to 1.5 percentage units lower than normally obtained from hard red spring wheats grown under similar conditions.

Table 3. Seedling and adult plant reactions of three winter wheat varieties to the stem rust fungus, *Puccinia graminis* f. sp. *tritici*.

	Race, stage and varietal reaction*					
	Seedling			Adult		
Variety	15B	56	151	15B	56	151
Roughrider	MS	R	R	R,S	R	R
Froid	MS	S	S	S	S	MS
Winoka	MS	S	MS	MS	MS	MS

**R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, Comma = plant mixture.*

Table 4. Summary of average quality data for Froid, Winoka and Roughrider grown comparably at North Dakota stations (1974-75 crops).

Variety	Test weight	Vitreous kernels	Wheat* protein	Flour* protein	Protein* difference from wheat to flour	Flour yield	Flour* ash
	lbs/bu	%	%	%	%	%	%
Froid	56.8	81	13.6	12.8	-0.8	70.4	0.43
Winoka	59.1	74	12.8	12.0	-0.8	72.1	0.44
Roughrider	58.5	83	13.6	12.8	-0.8	70.8	0.48

**Expressed on 14.0% moisture basis*

Table 5. Summary of average quality data for Froid, Winoka and Roughrider grown comparably at North Dakota stations (1974-75 crops).

Absorption*	Mixing time	Loaf volume	Grain & texture	Crumb color	Crust color	Loaf symmetry	Farinogram classification
%	min.	cc.	1-10	1-10	1-4	1-5	1-8
57.2	7.4	819	8.3	7.8	4	4.4	5.6
58.3	7.1	811	8.1	7.9	4	4.4	5.9
60.7	6.2	821	7.9	7.1	4	4.5	5.6

**Expressed on 14.0% moisture basis*

Flour yield and flour ash (mineral) content are important milling properties. Roughrider and Froid had similar flour yields, while a higher flour percentage was obtained from Winoka. Froid and Winoka were both lower for flour ash, which is more desirable, than was Roughrider.

Water absorption is of importance from the baking standpoint since a flour with high absorption will produce more pounds of bread per sack than one with lower absorption. The absorption of Roughrider is considerably better than that of either Winoka or Froid.

Loaves baked from each flour were classified for various external and internal properties. Loaf volume, loaf symmetry and crust color were similar for all three varieties. The internal characteristics, grain and texture and crumb color, were less desirable for Roughrider than for Froid or Winoka.

The Farinograph is a recording dough instrument that measures plasticity and mobility of dough subjected to prolonged, relatively gentle mixing action at a constant temperature. Resistance offered by the dough to the mixing blades is transmitted through a dynamometer (a device which measures mechanical energy) to a pen that traces a curve on a kymograph chart. This chart, which is commonly called a farinogram, provides information concerning the mixing time, the mixing tolerance and the absorption (or water-binding capacity) of the flour being tested.

A typical farinogram pattern for Roughrider is shown in Figure 1. The farinogram classification for the varieties showed Roughrider and Froid to be similar, with Winoka displaying slightly stronger mixing properties. However, all would be ranked as having "medium strong" mixing properties and all would be satisfactory.

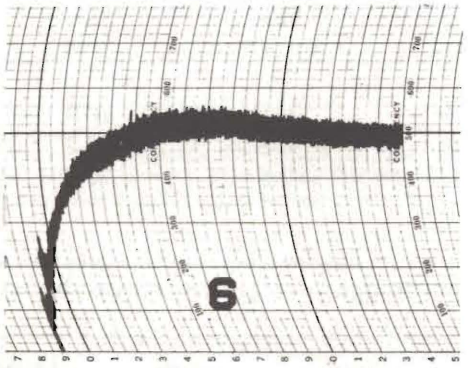

Figure 1. Farinogram showing average mixing properties of Roughrider.

Botanical Description

Roughrider is a hard red winter wheat variety, *Triticum aestivum* L., with the following botanical description:

Growth habit: winter type.

Stem: midtall, white, midstrong, hollow.

Spike: awned, fusiform, lax, inclined.

Glume: glabrous, white, short, narrow; shoulders narrow and wanting; beaks acuminate.

Kernel: red, midlong, hard, ovate; germ midsized; crease narrow, middeep; cheeks rounded; brush midlong.

Breeding History

Roughrider, CI 17439, is a selection from the cross Seu Seun/CI 12500//Red Chief/Pawnee/3/Cheyenne/4/Hume/5/Yogo/Frontana//2*Minter made in 1965 at South Dakota State University to combine winterhardiness and disease resistance. The early segregating generations were grown in bulk in South Dakota. A single plant selection made in the F_4 generation in 1969 resulted in this variety. Agronomic, disease and quality tests have been conducted in North Dakota since 1970.

Seed Increase and Allocation

The first increase of Roughrider was made at the Agronomy Seed Farm, Casselton, ND in 1974, producing about 30 pounds of seed. This was increased again at Casselton in 1975 and produced enough to seed a total of 24 acres at Casselton and Williston for 1976 production. Foundation seed available from these increases will be allocated in North Dakota to county crop improvement associations and the Seed Division of the North Dakota Agricultural Association. This allocation will be made after the 1976 harvest in time for fall seeding of the 1977 crop. Allocations also will be made to other states in compliance with the policy of mutual sharing of new variety seed stocks.

The North Dakota Agricultural Experiment Station will maintain Breeders Seed of Roughrider hard red winter wheat for Foundation seed growers so long as the variety is in commercial demand.

Summary

Roughrider, a new hard red winter wheat variety, has been released by the North Dakota Agricultural Experiment Station. Roughrider is higher yielding and more lodging resistant than either Froid or Winoka. It has a heavier test weight, earlier maturity and shorter height than Froid. Its winterhardiness is similar to Froid and superior to Winoka. Roughrider is resistant to stem rust, but susceptible to leaf rust.

The overall milling and baking quality of Roughrider is satisfactory. It was faulted for high flour ash and slightly inferior bread crumb texture and color. Roughrider has a lower protein content than hard red spring wheats, has high bake absorption and is satisfactory for other quality characteristics.