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DARRELL

A High Yielding Hard Red Winter Wheat

B754

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Origin and breeding history

Darrell, a hard red winter wheat (*Triticum aestivum* L.), was developed by the South Dakota Agricultural Experiment Station and released in 2006 to seed producers by the developing institution and the Nebraska Agricultural Experiment Station. Darrell was released on the basis of its good disease resistance and excellent yield potential in the northern Great Plains. Darrell has been named to honor Darrell Wells, late former winter wheat breeder at South Dakota State University 1962–1982.

Darrell was selected from the cross 2076-W12-11/‘Karl 92’ (PI 564245)//NE89526 and developed by means of the bulk breeding method. The cross (coded XNE94031) was developed by P.S. Baenziger at the University of Nebraska and shared as an F₂ population. It was planted as an F₃ bulk in South Dakota in 1997. Darrell was derived as an F_{3:4} line selected by S.D. Haley in 1998. Darrell was evaluated as SD98102 in the South Dakota Early Yield Trial nursery in 1999, in the Preliminary Yield Trial in 2000, and in the Advanced Yield Trial in 2001. It was tested in the South Dakota Crop Performance Testing (CPT) variety trial between 2002 and 2006 and in the Northern Regional Performance Nursery in 2003 and 2004.

Breeder seed originated from a purification program in 2002/2003, 2003/2004, and 2004/2005 seasons designed to remove off-types by rouging. Darrell has been uniform for all morphological characters (such as maturity and plant height) during the last four generations of increase. Darrell contains 0.17% red chaff off-type and 0.15% tall white chaff variant.

The South Dakota Foundation Seed Stocks Division (Plant Science Department, South Dakota State University, Brookings) had foundation seed of Darrell available to seed producers for planting during Fall 2006. Seed classes will be Breeder, Foundation, Registered, and Certified. Darrell will be submitted for U.S. Plant Variety Protection under P.L. 910577 with the certification option.

Characteristics

Darrell is awned and has green foliage at anthesis. The spike is tapered, inclined, and mid-dense. At maturity, Darrell has white, midlong, midwide glumes that have wanting shoulders and acuminate tips. Kernels are red, hard textured, and elliptical in shape with collarless short brushes, rounded cheeks, and shallow creases.



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Darrell is a medium maturing wheat similar to Harding and Crimson, and a day later than Millennium. Plant height is similar to Tandem, slightly taller than Arapahoe, and shorter than Harding. The winter survival of Darrell, as tested in South Dakota in the very cold winter of 2001, was good, similar to Alliance. Winter survival of Darrell during 2003–2006 was excellent. Darrell has a medium-long coleoptile similar to Expedition. Darrell has good straw strength similar to Alliance and better than Arapahoe and Trego.

Agronomic performance and quality

Darrell has a very good yield potential (Tables 1 and 2). In replicated trials conducted at eastern South Dakota locations from 2004 to 2006, Darrell yielded 1 to 7 bu/A more than the locations average. At the same locations, Darrell yielded more than Wendy, Wesley, Expedition, Trego, and Arapahoe but yielded 1 bu/A less than Millennium. In replicated trials conducted at western South Dakota locations, Darrell had the highest average yield for the period 2004–2006 and was in the top yielding group in 2006. In 2006, Darrell was in the top performance group for test weight (61 lb/bu) and for grain protein (13.9%) (Table 3).

Composite milling and bread baking properties of Darrell were determined during 2003–2005 cooperative baking tests conducted by the USDA-ARS Hard Winter Wheat Quality Laboratory in Manhattan, Kan. Darrell has acceptable milling and good baking quality. Relative to the check cultivars Millennium and Arapahoe, Darrell had similar kernel size and similar extraction flour yield. Flour protein of Darrell was higher than that of both Millennium and Arapahoe. In bread baking tests, flour water absorption and loaf volume of Darrell were both higher than that of Millennium and Arapahoe.

Darrell was evaluated in the Wheat Quality Council tests in 2004. In spite of having the red kernel color, Darrell has relatively low grain polyphenol oxidase (PPO) levels and very desirable alkaline noodles characteristics. Darrell was found to have a bright noodle sheet color similar to Lakin, better chewiness than Lakin, and an average cooking loss slightly higher than Lakin.

Disease resistance

Darrell has good resistance to stem rust, is moderately resistant to stripe rust, and moderately susceptible to leaf rust, wheat streak mosaic virus, and wheat soil-borne mosaic virus. Darrell had the best field disease ratings for reaction to Fusarium head blight among all Great Plains wheat varieties tested during the last 6 years.

Table 1. A comparison of Darrell hard red winter wheat yield (bu/A) with yield of other popular white winter wheat varieties at six eastern South Dakota locations, 2004-2006.

	Brookings		Watertown		Platte		Highmore		Dakota Lakes		Winner	
	'06	3-yr	'06	3-yr	'06	3-yr	'06	3-yr	'06	3-yr	'06	3-yr
	bu/A											
Alliance	81	65	51	43	48	48	67	23	47	41	47	
Arapahoe	82	69	50	46	46	45	67	28	46	35	44	
Crimson	73	62	42	54	51	46	62	23	46	37	41	
Darrell	84	68	48	53	57	42	66	32	50	37	49	
Expedition	85	70	51	56	49	40	59	27	45	37	40	
Harding	71	69	45	46	52	49	67	24	44	37	48	
Hatcher	78	-	59	55	-	46	-	24	-	38	-	
Jagalene	65	59	42	51	49	44	63	24	52	41	52	
Millennium	79	78	44	57	55	42	66	33	49	31	46	
Overland	85	-	52	53	-	32	-	31	-	38	-	
Wahoo	78	74	44	49	51	44	69	27	48	35	46	
Wesley	81	71	53	49	49	52	64	30	47	34	39	
Alice	72	63	47	62	51	46	63	29	47	39	47	
NuDakota	89	-	52	72	-	49	-	27	-	37	-	
NuFrontier	66	-	40	54	-	50	-	25	-	38	-	
Trego	72	58	47	48	46	51	62	27	47	38	50	
Wendy	80	68	49	49	41	34	60	32	51	38	47	
Average	78	67	47	53	50	45	64	27	48	37	46	

Table 2. A comparison of Darrell hard red winter wheat yield (bu/A) with yield of other popular winter wheat varieties at five western South Dakota locations and statewide averages for yield (bu/A), bushel weight (BuWt) and percent grain protein (Prot), 2004-2006.

	Martin		Oelrichs		Bison		Sturgis		Wall		2006 Statewide Averages		
	'06	3-yr	'06	3-yr	'06	3-yr	'06	3-yr	'06	3-yr	Yield (bu/a)	BuWt (lb)	Prot (pct)
	bu/A												
Alliance	42	-	54	-	17	-	33	30	46	48	49	60	11.9
Arapahoe	45	-	52	-	17	-	30	26	42	42	46	60	14.3
Crimson	42	-	51	-	14	-	33	27	34	43	44	61	14.5
Darrell	52	-	55	-	19	-	39	32	43	49	50	61	13.9
Expedition	44	-	56	-	17	-	33	28	46	45	48	60	13.9
Harding	40	-	52	-	18	-	33	28	42	48	45	60	14.5
Hatcher	55	-	62	-	12	-	38	-	41	-	50	60	13.8
Jagalene	42	-	57	-	16	-	38	31	42	47	46	62	13.6
Millennium	43	-	56	-	19	-	32	32	41	48	46	60	13.9
Overland	44	-	52	-	13	-	28	-	46	-	47	60	13.0
Wahoo	45	-	61	-	16	-	36	30	48	53	48	59	13.6
Wesley	48	-	52	-	17	-	34	29	42	44	48	59	14.5
Alice	47	-	52	-	17	-	37	27	45	45	48	61	13.5
NuDakota	50	-	58	-	16	-	31	-	47	-	50	59	13.6
NuFrontier	46	-	57	-	11	-	35	-	44	-	47	61	13.4
Trego	53	-	54	-	17	-	36	32	40	42	48	61	13.0
Wendy	48	-	49	-	19	-	33	27	46	46	48	60	13.8
Average	46	-	55	-	16	-	34	29	43	46	47	60	13.7

Table 3. Agronomic traits and disease reactions for Darrell hard red winter wheat and other winter wheat varieties.

	Rel Hdg*	Origin	Lodg Res	End- Use Qty	Traits#		Wht Strk Msc	Disease Reaction+				PVP**
					Wntr hardy Ttg	Cole- optile Pct##		Tan Spot	Stripe Rust	Leaf Rust	Stem Rust	
Alliance	2	NE-93	G	AB	G	76	MS	VS	MR	S	MS	Yes
Arapahoe	3	NE-88	F	GB	G-E	83	S	S	MS	MR	MR	Yes
Crimson	5	SD-97	G	GB	G-E	110	MR	R	MR	S	MS	Yes
Darrell	5	NE/SD-06	G	AB	G	92	MS	MR	MR	MS	R	***
Expedition	0	SD-02	F	EB	G-E	88	S	MS	MS	MS	R	Yes
Harding	5	SD-99	F-G	AB	E	100	MR	MR	MS	MR	MR	Yes
Hatcher	2	CO-04	E	EB	F-G	92	S	-	MR	MR	MR	Yes
Jagalene	3	AW-02	E	AB	G	92	MS	MR	MR	MS	MR	Yes
Millennium	4	NE-99	G	AB	F-G	78	S	MS	MR	MS	MR	Yes
Overland	4	NE-06	E	AB	G	92	MS	MR	S	MR	MR	**
Wahoo	3	NE/WY-01	G	AB	G	91	-	MR	MR	S	R	Yes
Wesley	2	NE-98	E	AB	G-E	79	S	MR	MR	MS	R	No
Alice	-1	NE/SD-06	G	EB	G	67	MR	-	MR	-	MR	***
NuDakota	1	AW-06	E	-	G	-	MS	MR	MR	R	MR	Yes
NuFrontier	4	AW-05	G	-	G	87	MS	MS	MR	MS	MR	Yes
Trego	3	KS-99	F-G	EB	F-G	80	S	MS	S	MR	R	Yes
Wendy	-1	SD-04	E	GN	E	67	MS	R	MR	MS	MR	Yes

* Heading, the relative difference in days to heading, compared to Expedition.

E = excellent, A = Acceptable, F = Fair, G = Good, P = Poor, B = Baking, N = Noodles.

Percent of Harding (3-1/4" long).

+ R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, VS = very susceptible.

** Plant variety protection (PVP), title V, certification option – to be sold by variety name only as a class of certified seed.

*** PVP application pending or anticipated.



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