

HY320 RED SPRING WHEAT

HY320 red spring wheat (*Triticum aestivum* L.) combines high grain yield potential with semidwarf stature and wide adaptation. HY320 is the first licensed wheat cultivar eligible for grades of Canada Prairie Spring. It was registered on 23 Jan. 1985. Breeder seed of HY320 will be maintained by Agriculture Canada Experimental Farm, Indian Head, Saskatchewan.

Key words: Wheat (spring), high yield, cultivar description

[Blé roux de printemps HY320.]

Titre abrégé: Blé roux de printemps HY320.

Le blé roux de printemps (*Triticum aestivum* L.) HY320 combine un potentiel de rendement grainier élevé à un port demi-nain et à une large adaptation. C'est le premier cultivar de blé homologué et admissible aux catégories de printemps des Prairies canadiennes. Il a été homologué le 23 janvier 1985. La semence de l'obteneur sera maintenue par la Ferme expérimentale fédérale de Indian Head, en Saskatchewan.

Mots clés: Blé (de printemps), rendement élevé, description de cultivar

HY320 red spring wheat (*Triticum aestivum* L.) was developed at the Agriculture Canada Research Station, Swift Current, Saskatchewan, as part of the South Saskatchewan Wheat Breeding Program. License no. 2479 was issued for HY320 on 23 January 1985 by Plant Health and Plant Products Directorate, Food Production and Inspection Branch of Agriculture Canada.

Pedigree, Breeding Methods and Historical Information

HY320 was selected by the modified pedigree method from a cross made in 1968 between Tobari 66 and Romany, two cultivars from the International Maize and Wheat Improvement Centre (CIMMYT). The cross was made at the National Plant Breeding Station, Njoro, Kenya as part of a technical assistance program to Kenya funded by the Canadian International Development Agency and co-ordinated by the University of Manitoba under the leadership of L. H. Shebeski. In 1970, 285 F₃ lines were brought from Kenya by E. A. Hurd and grown at Swift Current. In 1971, 116 F₄ lines were evaluated for grain yield potential using replicated tests at two locations. Head selections were made from the F₄ plots, and F₅ head-rows were established in a winter nursery of the most

promising F₄ lines. In 1972, 177 F₆ lines were evaluated for grain yield potential using replicated tests at two locations. Nineteen of the most promising F₆ lines were harvested as individual lines and tested in 1973 for grain yield, agronomic performance, leaf and stem rust reaction, and end-use suitability factors. A line designated 7029-66-9 was selected and subsequently evaluated in the Non-Bread Wheat Co-operative tests as NB320 from 1974 to 1978 and 1981, and as HY320 in the High Yielding Co-operative tests from 1982 to 1984. The 1971-1972 winter nursery records do not indicate whether a single F₅ plant was selected or whether the F₅ headrow was selected and harvested on a row-basis. Therefore, HY320 derives from either a single F₄ or F₅ plant. In 1977, several hundred head-rows were established and uniform rows were harvested individually. In 1978 paired rows were grown at Research Station, Agriculture Canada, Regina and uniform paired rows were selected to produce the 122 breeder lines of HY320.

Performance and Adaptation

The main attribute of HY320 has been high stable grain yield in all areas of Western Canada (Tables 1 and 3). HY320 has averaged 30% more grain yield than Neepawa in Manitoba and Eastern Saskatchewan, 26 and 27% more grain yield than Neepawa in

Table 1. Grain yield (00 kg ha^{-1}) of HY320 and check cultivars, Non-Bread Wheat Cooperative Tests (1974, 1976-1978, 1981) and High Yielding Wheat Cooperative Tests (1982-1984)

Year	Cultivar	Zone 1† (35)‡	Zone 2 (46)	Zone 3 (25)	Mean§
1974	HY320	24.3	25.3	33.0	27.3
	Neepawa	18.5	21.8	27.4	22.3
	Glenlea	21.7	22.7	28.1	24.0
1976	HY320	48.5	44.1	48.2	46.6
	Neepawa	35.0	34.3	35.7	34.9
	Glenlea	39.9	34.1	40.9	37.7
1977	HY320	38.1	48.5	46.1	43.5
	Neepawa	26.0	37.5	34.7	32.0
	Glenlea	34.4	39.9	37.7	37.0
1978	HY320	39.5	40.5	51.5	43.1
	Neepawa	31.3	30.1	35.5	31.9
	Glenlea	39.1	31.7	44.2	37.5
1981	HY320	43.7	33.7	43.1	38.6
	Neepawa	35.4	27.2	36.8	31.6
	Glenlea	46.4	25.6	40.5	34.7
1982	HY320	43.4	43.0	48.6	43.9
	Neepawa	31.3	33.6	40.4	33.7
	Glenlea	37.8	36.5	45.1	38.2
1983	HY320	36.1	39.0	35.5	37.3
	Neepawa	29.0	31.3	31.9	30.5
	Glenlea	34.9	36.2	41.4	36.5
1984	HY320	40.6	24.7	47.8	32.5
	Neepawa	35.7	21.6	36.2	27.5
	Glenlea	41.4	21.2	43.0	29.9
Mean	HY320	39.3	37.4	44.2	39.1
	Neepawa	30.3	29.7	34.8	30.6
	Glenlea	37.0	31.0	40.1	34.4

†Zone 1 = Manitoba and Eastern Saskatchewan; Zone 2 = Southern Alberta and Western Saskatchewan; and Zone 3 = Peace River and Parkland.

‡Number of station years of data in parentheses.

§Means over zones within years are weighted by number of tests. Means over years within zones are weighted by number of years. Grand mean is weighted by number of years.

Southern Alberta and the Peace River-Parkland areas, respectively. HY320 also surpassed the Canada Utility cultivar Glenlea in grain yield by 6, 20 and 10% in Zones 1, 2 and 3, respectively. Under irrigated conditions HY320 yielded 37, 29 and 3% more than Neepawa, Glenlea and Fielder, respectively.

On average, HY320 requires 4 d longer to mature than Neepawa (Table 2); however, under cool, moist conditions during the ripening phase the maturity difference can extend to more than 10 d. HY320 has a semidwarf stature being about 4 cm, 15 cm and 20 cm

shorter than Fielder, Neepawa and Glenlea, respectively (Tables 2 and 3). It has strong stiff straw, but under certain conditions such as rain with winds, it can lodge more than Neepawa. Based on observation, HY320 does not appear to recover after lodging as well as Neepawa. HY320 is photoperiod insensitive and has a slight vernalization requirement. The precise requirements have not been determined.

HY320 is the first cultivar registered which is eligible for grades of Canada Prairie Spring wheat. The end-use suitability factors of kernel hardness, protein content, and gluten

Table 2. Agronomic performance of HY320 and check cultivars, Non-Bread Wheat Cooperative Tests (1974, 1976–1978, 1981) and High Yielding Wheat Cooperative Tests (1982–1984)

Cultivar	Yield (⁰⁰ kg ha ⁻¹) (106)†	Maturity (d) (79)	Height (cm) (93)	Lodging 1-9)‡ (47)	Test wt. (kg hL ⁻¹) (90)	1000-kernel wt (g) (87)
HY320	39.5	105.1	72.0	1.8	78.2	39.1
Neepawa	30.8	101.2	87.0	1.6	78.2	33.0
Glenlea	34.8	104.3	92.0	2.0	78.4	43.5

†Number of station years of data in parentheses.

‡1-9; 1 = no lodging, 9 = completely lodged.

Table 3. Agronomic performance of HY320 and check varieties, Irrigated High Yielding Wheat Cooperative Test (1981–1984)

Cultivar	Class†	Yield (⁰⁰ kg ha ⁻¹) (17)‡	Maturity (d) (11)	Height (cm) (13)	Lodging (1-9)§ (5)
HY320	CPS	53.9	105.6	75	2.2
Neepawa	CWRS	39.2	102.1	91	1.7
Glenlea	CU	41.9	104.1	97	2.1
Fielder	CWSWS	52.5	105.5	79	1.3

†CPS = Canada Prairie Spring; CWRS = Canada Western Red Spring; CU = Canada Utility; CWSWS = Canada Western Soft White Spring.

‡Number of station years of data.

§1-9; 1 = no lodging, 9 = completely lodged.

strength are intended to be at a medium level (Hetland 1978).

The kernel hardness of the 122 breeder lines of HY320 was determined on a burr mill described by Kosmolak (1978). The frequency distribution for grinding time of the breeder lines exhibited a bimodal distribution with 48 lines being as hard as Neepawa and 68 lines being softer than Pitic 62 (Table 4). The grinding time for HY320 (43) was similar to the mean of the lines (43.6). Estimates of repeatability of kernel hardness using the burr mill varied from 0.85 to 0.97 depending on the range of kernel hardness of the cultivars assessed.

A composite of nine breeder lines with grinding time values between 26.5 and 28.5 s and another composite of seven breeder lines with grinding values between 28.6 and 35.5 were grown in 1986 and compared to HY320 and Neepawa. Grinding time values obtained in 1986 were 32, 35, 40 and 28 s for the two composites of breeder lines, HY320 and Neepawa, respectively. Therefore, HY320 is not uniform for kernel hardness and it is possible to select for a harder kernel type.

Table 4. Frequency distribution for grinding time of the 122 breeder lines of HY320 and grinding time for five check cultivars

Class interval for grinding time (s)	Frequency	Cultivar	Grinding time (s)
24-29	48	Glenlea	24
30-35	4	Neepawa	25
36-41	0	Norstar	26
42-47	2	HY320	43
48-53	30	Pitic 62	46
54-59	20		
60-65	13		
66-71	3		
72-77	1		
78-83	0		
84-89	0		
90-95	1		

Description

SPIKES. Oblong to fusiform, middense, midlong, erect, awned; glumes wide, long, glabrous, white; glume shoulders oblique to rounded, narrow to midwide; glume beaks midwide, acuminate.

KERNEL. Color light red; shape long to mid-long; midwide, elliptical; cheeks rounded to angular; brush midsize with midsize hairs;

Table 5. Disease reactions of HY320 and check cultivars, Non-Bread Wheat Cooperative Tests (1974, 1976-1978, 1981) and High Yielding Wheat Cooperative Tests (1982-1984)

Cultivar	Year	Leaf rust	Stem rust	Loose smut	Bunt	Common root rot
HY320	1974	10MR-40†M‡	30MR	82	-	22§
	1976	5R-40MR	60MR	65	-	13
	1977	TR	TR	-	-	28
	1978	5R	5MR	MS	MS	36
	1981	10R	10MR	56S	40S	23
	1982	30MR	10R-MR	HS	I	32
	1983	10R	10VR	96HS	17I	19
	1984	0TR	30R	-	75S	-
Neepawa	1974	50MR	5M	10	-	17
	1976	50MS	3M	26	30	7
	1977	30M	TR	-	-	14
	1978	40M	3M	R	MR	30
	1981	50M	TR-30M	-	10I	16
	1982	40MR-MS	VR	MR	R	27
	1983	50M	10R	-	8I	15
	1984	60M	10R	-	27I	-
Glenlea	1974	TR	TR	0	-	15
	1976	TR	TR	0	30	6
	1977	TR	TR	-	-	21
	1978	TR	1MR	R	R	21
	1981	TR	TR	0R	14I	12
	1982	TR-MR	VR	R	R	19
	1983	TR	5VR	-	7I	10
	1984	0TR	5VR	-	41I	-

†Percent infection.

‡Type of reactions: TR = trace resistant; VR = very resistant; R = resistant; MR = moderately resistant; I = intermediate resistance; M = intermediate to MR and MS; MS = moderately susceptible; S = susceptible; HS = highly susceptible; and - = no data available.

§Disease index.

crease midwide to wide; middeep to deep, frequently pitted; germ small to midsize, ovate.

MATURITY. About 4 d later than Neepawa.

STRAW. Semidwarf stature averaging 15 cm shorter than Neepawa.

LODGING TOLERANCE. Slightly better than Neepawa, but under certain conditions such as rain with high winds, it may be substantially worse.

SHATTERING RESISTANCE. Good.

DROUGHT TOLERANCE. Comparable to Neepawa.

DISEASE REACTION. Resistant to prevalent races of stem rust caused by *Puccinia graminis* Pers. f. sp. *tritici* Eriks. and E. Henn. and leaf rust caused by *P. recondita*

Rob. ex. Desm. f. sp. *tritici*; moderately susceptible to common root rot caused primarily by *Bipolaris sorokiniana* (Sacc. in Sorok.) Shoem; susceptible to common bunt caused by *Tilletia foetida* (Wallr.) Liro and *T. caries* (DC.) Tul.; and highly susceptible to loose smut caused by *Ustilago tritici* (Pers.) Rostr. (Table 5).

PHOTOPERIOD RESPONSE. Insensitive.

END-USE SUITABILITY. Eligible for grades of Canada Prairie Spring (red).

Maintenance and Distribution of Pedigreed Seed

Breeder seed originating from 122 breeder lines will be maintained by the Seed Section of the Agriculture Canada Experimental Farm, Indian Head, Saskatchewan, Canada SOG 2K0. Distribution and multiplication of

pedigreed seed stocks will be handled by SeCan Association, 512-885 Meadowlands Drive, Ottawa, Ontario, Canada K2C 3N2.

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