

REQUEST FOR SUPPORT OF REGISTRATION OF **PT5003**

CROP KIND: Wheat

TYPE: Canada Western Red Spring

PROPOSERS: P. Hucl and C. Briggs
CDC, Univ. of Saskatchewan, Saskatoon, SK, S7N 5A8

TEST NUMBERS: PT5003, W15423

PEDIGREE: CDC Go*4/04GC139/3/W09130/2/CDC Go*2/ CDC Alsask

PT5003 was selected from the cross CDC Go*4/04GC139/3/W09130/2/CDC Go*2/ CDC Alsask made at the University of Saskatchewan during the summer of 2010 in a growth chamber. 04GC139 is an experimental spring wheat line developed at AAFC – CRC by Dr. Julian Thomas and is the source of FHB tolerance in PT5003. The line BW781.86 (CDC Go*4/04GC139) was evaluated in a study on FHB QTL stacking by Brar et al. (Molecular Breeding (39), 2019). The line carried a triple stack. W09130 is an experimental line developed by the CDC. W09130 has the pedigree CDC Go*2/PT435. PT435 is the source of Lr22a in PT5003.

The resulting F₁ from the final cross was grown in a growth chamber during the winter of 2010/2011 and selected for the presence of molecular markers for Lr22a, Lr21 and Lr34 (PT5003 does not carry a marker for Lr34 and was not tested for the defeated gene, Lr21). The F₂ was grown as a bulk at Saskatoon in 2011. The F₃ generation was grown in a bulk plot in New Zealand during the winter of 2011/2012. The F₄ was grown in a space-planted nursery at Saskatoon in 2012. The F₅ and F₆ generations were grown in hills at Saskatoon in 2013 and 2014.

Seed from a bulked F₆ row was used as a source for entry into a replicated yield trial grown at Saskatoon in 2015. The entry was also evaluated for reaction to leaf and stem rust in an irrigated nursery from 2013 to 2015.

PT5003 was evaluated as W15423 in a replicated test at four sites in 2016 (three in SK, one in MB) and in the Parkland 'B' test in 2017 (as code#20). PT5003 was subsequently evaluated in the Parkland Cooperative Test from 2018 to 2020.

AREA OF ADAPTATION: Spring wheat growing regions of Western Canada.

STRENGTHS: PT5003 is higher yielding than all the checks with intermediate maturity, reduced plant height. Lr22a carrier.

WEAKNESSES:

DESCRIPTION: PT5003 is a reduced height line with awns and hollow stems. PT5003 is intermediate in maturity. In three years of testing in the Parkland Wheat Cooperative Test, PT5003 yielded 114.9% of the mean of the check cultivars (Table 1). PT5003 was later maturing than Parata but earlier maturing than Carberry (-3 days) and Glenn (-2 days). PT5003 had shorter straw relative to Glenn and Parata but was 1.5 cm taller than Carberry (Table 1). PT5003 was intermediate for lodging score and had a test weight and seed mass in the range of the checks (Table 1).

PT5003 was resistant to prevalent races of leaf rust and stem rust and varied in reaction to stripe rust (Tables 2 and 3). PT5003 was "R" for common bunt in two years of testing (Table 2). A majority of the FHB reactions for PT5003 were MR or I (Tables 2 and 3).

In two years of quality evaluation PT5003 garnered a "DNO" vote (Table 4). In 2020 the grain protein content of PT5003 was 1% lower than the mean of the checks and thus based on the guidelines on the interface between being flagged and rated poor for the trait.

Table 1. Agronomic data for PT5003 and check cultivars in the Parkland Wheat Cooperative Test, 2018 to 2020

Three year Means	Yield	Yield	Maturity	Plant	Height	Grain	Grain	NIR
	(kg/ha)	(%Chk)	(days)	(cm)	(1-9)	Wt.	Wt.	Prot.
2018-2020	(kg/ha)	(%Chk)	(days)	(cm)	(1-9)	(kg/ha)	(g/1000)	(%)
Carberry	5082	100.7	106.2	84.4	1.5	80.8	40.0	13.9
Glenn	5042	99.9	105.0	92.3	1.6	82.7	38.6	14.2
Parata	5020	99.4	102.0	91.6	2.1	80.8	37.8	14.5
PT5003	5799	114.9	103.1	85.9	2.0	80.8	39.0	13.9
Chk Mean	5048		104	89	2	81	39	14
LSD (0.05)	188		1.1	1.5	0.5	1.3	1.1	0.8
No. of Env	35		35	35	35	35	35	35
SE	96.0		0.57	0.79	0.23	0.65	0.55	0.39

Table 2. Disease reactions of PT5003 and check cultivars, PKC Test (2018 and 2019).

2018																								
Fusarium Head Blight																	Stripe Rust							
SR Brandon			LR				Bunt Leth		Morden			Carman			Ottawa				Crest		Leth		LS Melfort	
Entry	Sev	IR	Sev	Rxn*	Mean	Class	Index	DON	ISD	Index	DON	ISD	Index	DON	ISD	Rank	Sev	IT	Sev	Rxn	Mean	Rat.		
2020																								
Splendor	2	MR	36.7		10	MR	28.9	7.6	I	35.7	8.4	MS	24.8	28.4			1		57.5	S		3.3		
Carberry	5	MR	2.7	R	0	R	12.8	3.1	MR	12.1	3.0	MR	34.5	13.4			1		6	R		3.3		
Glenn	5	MR	22.0	MR	4	R	19.8	3.1	MR	17.3	4.8	I	11.0	15.8			1		13.5	MR		2.7		
Parata	5	MR	7.7	R	0	R	9.7	2.2	MR	20.3	3.7	I	27.3	18.5			1		42.5	MS		3.0		
PT5003	30	I	0.0	R	1	R	13.8	2.1	MR	12.7	3.4	I	X	5.8			1		3.5	R		3.7		
2019																								
Fusarium Head Blight																	Stripe Rust							
SR Brandon			LR				Bunt Leth		Morden			Carman			Charlottetown				Crest		Leth		LS Melfort	
Entry	Sev	IR	Sev	Rxn*	Mean	Class	Index	DON	ISD	Index	DON	ISD	Index	DON	ISD	Rank	Sev	IT	Sev	Rxn	Mean	Rat.		
Splendor	2	R	33.3		10	R	24.4	16.5		29.8	19.2		50.7	16.7		18	85	S	60	S				
Carberry	1	R	8.3	R	0	R	17.7	9.5		14.8	8.4		53.7	17.3		20	1	R	10	R				
Glenn	5	R	33.3		3	R	29.9	8.3		23.6	10.3		47.0	12.4		4	35	I	42.5	MS				
Parata	2	R	25.0	MR	3	R	30.6	9.6		18.3	4.8		53.0	15.8		14	35	I	60	S				
PT5003	40	MR	11.7	MR	3	R	34.3	9.2		25.3	10.5		53.3	13.4		7	1	R	25	MR				

Table 3. Disease reaction of PT5003 and check cultivars (2020).

Fusarium Head Blight																
Stem Rust		Stripe Rust			Leaf Rust		Morden				Carman					
(Morden)		Lethbridge			(Morden)		Mean	VRI%	DON	DON	Mean	VRI	FDK	DON	DON	
Sr	Sr	Sev1	Rxn1	Avg. Sev.	Rxn*	VRI	Rate	ppm	Rxn	VRI	Rxn	%	ppm	Rxn		
Sev	IR															
AAC Brandon	1	R	45	MS	13	MR	8.6	MR	11.2	MR	19.6	MR	2.6	4.0	R	
AC Carberry	1	R	25	MR	5	R	16.8	I	13.4	MR	20.1	MR	2.6	6.4	MR	
Glenn	1	R	40	I	37	I	23.8	I	10.7	MR	22.8	MR	3.0	5.1	MR	
Parata	1	R	40	I	35	I	26.2	MS	14.1	MR	37.7	I	7.1	9.5		
PT5003	5	I	30	I	0	R	13.5	MR	10.3	MR	22.8	MR	4.4	11.1		

Table 4. Quality evaluation of PT5003 and check cultivars, PKC Test (2018-2020).

Variety	Yr in Test	Vote				Wheat and Flour Characteristics					Milling Performance				Dough Properties					Baking Quality					Water dough colour				
		s	z	o	a	Grade (and degrading factors)	Wheat Pro	Flour Pro	Pro Loss	FN Amyl Peak		Clean Wht Flr Yld	Flr Yld PB 0.50 Ash	Flour Ash	Starch Dmg	Farino Abs	Farino DDT	Farino Stab	EXT Area	EXI Rmax	EXI Length	Lean No Time (LNT) Method					2h		
		3	2	1	0					3/b	550											75.3	76.5	0.45	7.6	65.2	5.50	4.5	78
BW 406 Glenn						1 CWRS	14.5	13.9	0.6	375	705	76.1	78.0	0.42	8.2	66.9	7.00	8.0	131	535	19.8	74	3.5	9.5	800	0.58	76.0	2.1	23.8
PT 772 Parata						1 CWRS	14.9	14.0	0.8	415	710	76.6	77.0	0.44	7.6	65.5	7.00	9.5	118	493	19.0	73	3.4	8.8	725	0.49	75.6	2.4	24.4
BW 874 Carberry						1 CWRS	14.8	13.8	1.0	3/b	550	75.3	76.5	0.45	7.6	65.2	5.50	4.5	78	281	20.9	72	2.7	6.9	690	0.42	75.8	2.0	24.3
BW 932 AAC Brandon						1 CWRS	14.6	13.6	1.0	330	625	76.4	78.5	0.41	7.7	66.4	6.25	6.0	77	306	19.4	73	2.7	7.4	710	0.43	76.6	1.8	24.9
2020 Mean of Checks							14.7	13.9	0.8	390	655	76.0	77.2	0.44	7.8	65.9	6.50	7.5	109	436	19.9	73	3.2	8.4	740	0.50	75.8	2.2	24.2
BW 406 Glenn						CW FEED - ERG 0.06 FRHTS; Base 2CWRS	13.9	13.3	0.6	295	385	75.4	76.5	0.45	9.3	68.9	6.25	7.0	117	446	20.8	76	3.7	9.4	815	0.54	77.0	2.9	22.8
PT 772 Parata						1 CWRS	14.7	14.0	0.7	425	505	75.9	76.0	0.46	7.9	67.4	6.75	7.5	108	406	21.4	74	3.2	8.0	715	0.45	77.3	3.2	23.2
BW 191 AC Splendor						1 CWRS	14.3	13.6	0.7	410	495	76.7	75.5	0.47	7.0	67.0	6.00	7.0	101	364	21.5	74	2.8	7.4	770	0.46	78.2	2.8	23.6
BW 874 Carberry						2CWRS - FRHTS, FUS DMG 0.5	14.1	13.1	1.0	305	235	76.4	76.0	0.46	8.2	66.5	5.50	4.5	84	283	22.8	74	3.0	7.8	715	0.44	77.4	2.9	23.8
2019 Mean of Checks							14.3	13.5	0.8	360	405	76.1	76.0	0.46	8.1	67.5	6.25	6.5	103	375	21.6	75	3.2	8.2	755	0.47	77.5	2.9	23.4
BW 406 Glenn		x	x	x	x	1CW RS-FUS DMG 0.14 MDGE 0.16 SPTD 0.07 FM 0.15	15.0	14.2	0.8	400	785	75.7	78.5	0.41	8.3	67.1	9.75	11.0	151	664	19.1	74	3.9	10.8	840	0.56	77.8	3.1	23.4
PT 772 Parata		x	x	x	x	1CW RS-FUS DMG 0.13 ERG 0.005	15.3	14.4	0.9	460	730	77.2	78.5	0.41	7.0	66.3	7.50	11.0	107	445	19.1	73	3.3	9.0	770	0.43	78.6	3.2	23.7
BW 191 AC Splendor		x	x	x	x	1CW RS-FUS DMG 0.21 MDGE 0.16	15.3	14.4	0.9	430	580	76.4	78.0	0.42	6.8	66.1	7.25	8.5	98	412	18.5	73	2.8	8.3	770	0.41	78.9	2.8	24.6
BW 874 Carberry		x	x	x	x	1CW RS-FUS DMG 0.09 MDGE 0.24 ERG 0.002 FRHTS present	15.2	14.1	1.0	405	555	76.1	77.5	0.43	7.5	66.3	6.25	7.0	94	371	20.0	73	3.3	10.0	745	0.45	78.2	3.0	24.4
2018 Mean of Checks							15.2	14.3	0.9	425	665	76.4	78.1	0.42	7.4	66.5	7.75	9.5	113	473	19.2	73	3.3	9.5	780	0.46	78.4	3.0	24.0
PT 5003	3rd					1 CWRS	13.7	12.8	0.8	415	490	76.2	77.5	0.43	8.1	64.0	5.50	7.0	87	362	18.4	71	2.9	7.5	705	0.48	76.2	1.8	26.0
PT 5003	2nd					2CWRS - FRHTS, FUS DMG 0.5	13.9	12.9	1.0	325	270	76.2	77.0	0.44	8.8	66.4	5.50	6.5	93	373	20.1	73	3.2	7.7	730	0.44	78.1	3.1	24.8
PT 5003	1st		21	3		1CW RS-FUS DMG 0.25 MDGE 0.13	14.4	13.6	0.9	430	425	76.7	79.0	0.40	7.8	64.7	6.75	9.0	97	432	17.9						79.4	3.1	25.4
74% extraction flour was used for all flour, dough and baking tests																													

Available breeder seed for distribution: 250 kg.