

## Request for Support of Registration of PT5019

**Crop Kind:** Spring Wheat

**Type:** Canada Western Red Spring

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**Experimental Designations:** PT5019, W21082

**Pedigree:** W12063/BW968

PT5019 was selected from the cross W12063/BW968 made at the Crop Development Centre (CDC), University of Saskatchewan during the fall of 2013. W12063 is an experimental line developed at the CDC derived from the cross BW384/BW864. BW384 is an experimental line developed by AAFC-CRC with the pedigree BW150\*2//Tp/Tm/3/2\*BW252/4/98A190/5/BW252. BW384 was evaluated for one year in the Central Bread Wheat Cooperative test in 2005. BW864 is an experimental line developed by AAFC-SPARC which was evaluated in the WBWC test in 2005. BW864 is a full sibling of the CWRS cultivars Carberry and Muchmore (pedigree: Alsen/Superb). BW968 is a CPSR variety developed by AAFC-SPARC registered as AAC Goodwin (pedigree: Carberry/AC Cadillac).

The F<sub>1</sub> generation from the cross W12063/BW968 was grown as rows in a field nursery in Saskatoon, SK during the summer of 2014. The F<sub>2</sub> generation was grown as a bulk plot in New Zealand during the winter of 2014-2015. The F<sub>3</sub> and F<sub>4</sub> generations were grown as bulk plots in Saskatoon during the summers of 2015 and 2016, respectively. The F<sub>5</sub> generation was grown in a space-planted nursery at Saskatoon in 2017 from which individual spikes were selected based on plant type. In 2018, the F<sub>6</sub> generation was grown as hill plots in an irrigated leaf rust and stem rust nursery in Saskatoon, and selections were made based on rust reaction, plant type, and straw strength. In 2019, F<sub>6;7</sub> lines were also grown as hill plots in an irrigated leaf rust and stem rust nursery in Saskatoon and selections were made based on rust reaction, plant type, and straw strength. A bulk harvested F<sub>6;7</sub> hill was used as a seed source for an unreplicated yield trial at Saskatoon in 2020. Selections were made from unreplicated yield trials based on improved grain yield, plant height, straw strength, and kernel characteristics.

In 2021, PT5019 was evaluated as W21082 in a replicated yield trial grown in five locations (4 in SK; 1 in MB) to assess agronomic performance. Reactions to leaf rust, stem rust, and stripe rust were assessed in nurseries established near Saskatoon, response to common bunt were assessed in a bunt nursery in Saskatoon, and response to fusarium head blight infection was assessed in Carman, MB. In 2022, W21082 was evaluated in the Western Bread Wheat 'B' (WBWB) test which was grown in eight locations (six in SK, one in MB, one in AB). In the WBWB, W21082 was evaluated for reactions to leaf and stem rust (AAFC-Morden), response to fusarium head blight (AAFC-Morden and UofM Carman), and stripe rust and common bunt (AAFC-Lethbridge).

PT5019 was evaluated in the Parkland Wheat Registration Trial from 2023-2025.

**Area of Adaptation:** Spring wheat growing regions of Western Canada.

**Strengths:** PT5019 was higher yielding than CWRS checks grown over three years of testing. PT5019 had a shorter plant stature with better lodging tolerance than CWRS checks over three years of testing. PT5019 had a higher test weight than all checks over three years of testing. PT5019 showed improvements in falling number relative to checks in two of three years, and an improvement in clean flour yield in all three years of testing.

**Weaknesses:** PT5019 had lower grain protein than CWRS checks.

**Description:** PT5019 is a reduced height line with awns and hollow stems. After three years of testing in the Parkland Wheat Registration Trial, PT5019 was 3% higher yielding than AAC Brandon (Table 1). Across three years of testing, PT5019 reached maturity 0.7 days later than AAC Brandon and had 0.5% less grain protein than AAC Brandon (Table 2). PT5019 was 5 cm shorter in height than AAC Brandon, and had improved lodging scores than all CWRS checks (Table 2). PT5019 had a 0.5 kg ha<sup>-1</sup> higher test weight and a similar kernel weight compared to AAC Brandon (Table 2).

PT5019 was resistant to prevalent races of leaf rust and stem rust (Table 3). In the first two years of testing, PT5019 was resistant to stripe rust, and in the third year, an intermediate reaction was observed. (Table 3). In the first two years of testing, PT5019 was resistant to common bunt, and in the third year, a moderately susceptible response was observed (Table 3). Most FHB reactions for PT5019 showed intermediate resistance (Table 4). PT5019 carries the *Sm1* gene and has resistance to the orange wheat blossom midge (Table 5). The PRCWRT Disease Evaluation Team supported PT5019 with the following ratings:

Leaf Rust -R

Stem Rust – R

Stripe Rust – MR

Common Bunt – MR

Fusarium Head Blight - I

In all three years of quality testing, PT5019 had improvements over checks in clean flour yield (Table 6). In the first two years of testing, PT5019 had lower grain and flour protein content, and had improvements in falling number (Table 6). PT5019 had weak dough extensibility (Ext Rmax) in year one but exceeded that of AAC Brandon in all three years of testing (Table 6).

**Breeder seed:** Approximately 450 kg of breeder seed for PT5019 is available through the University of Saskatchewan Crop Development Centre Breeder Seed Facility, Saskatoon, Saskatchewan.

**Table 1.** Grain yield of PT5019 and check cultivars in the Parkland Wheat Registration Trial from 2023-2025.

Entry	Grain yield (kg ha <sup>-1</sup> )				Grain yield (% AAC Brandon)			
	Zone 1	Zone 2	Zone 3	Western Canada	Zone 1	Zone 2	Zone 3	Western Canada
AAC Brandon	5640	5626	5843	5712	100.0	100.0	100.0	100.0
Carberry	5045	5275	5482	5318	89.5	93.8	93.8	93.1
Parata	4940	5170	5207	5147	87.6	91.9	89.1	90.1
Faller	5669	5934	6191	5990	100.5	105.5	106.0	104.9
AAC Penhold	5807	5714	5884	5795	103.0	101.6	100.7	101.5
<b>PT5019</b>	<b>5551</b>	<b>5837</b>	<b>6063</b>	<b>5878</b>	<b>98.4</b>	<b>103.8</b>	<b>103.8</b>	<b>102.9</b>
CV	7.1	5.6	8.2	7.0				
LSD (0.05)	318	249	300	168				
No. of Env	5	13	11	29				

**Table 2.** Average agronomic characteristics of PT5019 and check cultivars in the Parkland Wheat Registration Trial from 2023-2025.

Entry	Maturity (days)	Plant height (cm)	Lodging (1-9)	Test Weight (kg ha <sup>-1</sup> )	Kernel Weight (g/1000)	NIR Protein (%)
AAC Brandon	97.3	80	2.2	81.1	37.5	14.5
Carberry	97.5	79	2	81.3	37.5	14.5
Parata	94.4	87	2.8	80.1	34.6	15.3
Faller	97.4	81	2.9	79.8	38.2	13.5
AAC Penhold	96.6	72	1.7	80.3	40.1	13.8
<b>PT5019</b>	<b>98.0</b>	<b>75</b>	<b>1.8</b>	<b>81.6</b>	<b>37.8</b>	<b>14.0</b>
CV	1.8	4.7	40.5	0.88	3.7	3.5
LSD (0.05)	0.7	1	0.5	0.4	0.7	0.3
No. of Env	33	33	16	34	34	33

**Table 3.** Disease reactions of PT5019 and check cultivars to leaf rust, stem rust, stripe rust, and common bunt in the Parkland Wheat Registration Test from 2023 to 2025.

Entry	Field Leaf Rust						Field Stem Rust					
	2023		2024		2025		2023		2024		2025	
	Severity	Rating	Severity	Rating	Severity	Rating	Severity	Rating	Severity	Rating	Severity	Rating
AAC Brandon	4.3	R	4	R	8.3	R	1.3	R	1	R	1	R
Carberry	0	R	1	R	1.7	R	1	R	1	MR	1	R
Parata	0	R	5	R	5	R	1	R	1	R	1	R
Faller	21.7	MR	70	S	50	MS	1.3	R	1.3	R	1	R
AAC Penhold	2.3	R	6.3	R	0	R	2.7	MR	2.3	R	1	R
<b>PT5019</b>	<b>2.3</b>	<b>R</b>	<b>5</b>	<b>R</b>	<b>25</b>	<b>MR</b>	<b>1</b>	<b>R</b>	<b>1</b>	<b>MR</b>	<b>1</b>	<b>R</b>

**Table 3.** continued

Entry	Stripe Rust						Common Bunt					
	2023		2024		2025		2023		2024		2025	
	Severity	Rating	Severity	Rating	Severity	Rating	Severity	Rating	Severity	Rating	Severity	Rating
AAC Brandon	15	MR	0	R	38.3	I	20	I	23	I	28	MS
Carberry	5	R	2.5	R	40	I	2.5	R	10	R	14	I
Parata	0	R	-	-	63.3	S	30	S	32	MS	23	I
Faller	65	S	77.5	S	76.7	S	20	I	36	MS	54	S
AAC Penhold	5	R	35	I	50	MS	0	R	9	R	0	R
<b>PT5019</b>	<b>0</b>	<b>R</b>	<b>0</b>	<b>R</b>	<b>31.7</b>	<b>I</b>	<b>1</b>	<b>R</b>	<b>9</b>	<b>R</b>	<b>24</b>	<b>MS</b>

**Table 4.** Fusarium head blight reactions of PT5019 and check cultivars in the Parkland Wheat Registration Trial from 2023 to 2025.

Entry	Morden 2023				Carman 2023					Morden 2024			
	VRI (%)	VRI Rating	DON (ppm)	DON Rating	VRI (%)	VRI Rating	FDK (%)	DON (ppm)	DON Rating	VRI (%)	VRI Rating	DON (ppm)	DON Rating
AAC Brandon	24.2	I	12.8	MR	2.3	MR	1.7	0.9	MR	19.8	I	10.9	I
Carberry	25.7	I	14.3	MR	1.5	MR	1.6	0.7	MR	17.6	I	9.3	I
Parata	21.8	I	13.2	MR	6.8	I	2.5	1.6	I	20.8	I	7.3	MR
Faller	23.2	I	12.5	MR	2.8	MR	1.8	1	MR	14.9	I	5	MR
AAC Penhold	27	I	19.1	I	3	MR	3.7	1.7	I	22.1	I	8.1	I
<b>PT5019</b>	<b>20.8</b>	<b>I</b>	<b>20.2</b>	<b>I</b>	<b>6</b>	<b>I</b>	<b>3</b>	<b>1.5</b>	<b>I</b>	<b>26.9</b>	<b>I</b>	<b>13.9</b>	<b>I</b>

**Table 4.** continued

Entry	Carman 2024					Morden 2025			
	VRI (%)	VRI Rating	FDK	DON (ppm)	DON Rating	VRI (%)	VRI Rating	DON (ppm)	DON Rating
AAC Brandon	6.3	MR	15	2.1	MR	33.2	I	10.6	MR
Carberry	7.8	MR	10	3.1	MR	34.4	I	16.3	MR
Parata	25.3	I	21	4.7	MR	32.9	I	12.3	MR
Faller	9.8	MR	19	2.9	MR	31	I	10.9	MR
AAC Penhold	5.5	MR	25	2.9	MR	39	I	15.8	MR
<b>PT5019</b>	<b>15.8</b>	<b>I</b>	<b>24</b>	<b>3.5</b>	<b>MR</b>	<b>44.5</b>	<b>MS</b>	<b>15.7</b>	<b>MR</b>

**Table 5.** Midge damage assessments from spikes collected in midge-infested environments of the Parkland Wheat Registration Trial (2024-2025).

Entry	2024				2025			
	Resistant	Susceptible	Undamaged	Interpretation	Resistant	Susceptible	Undamaged	Interpretation
Carberry	0	35	25	Susceptible	0	41	49	Susceptible
AAC Brandon	1	27	32	Susceptible	0	31	39	Susceptible
AAC Penhold	0	34	26	Susceptible	0	23	37	Susceptible
Faller	3	27	30	Susceptible	0	24	26	Susceptible
Parata	0	30	30	Susceptible	0	38	52	Susceptible
<b>PT5019</b>	<b>14</b>	<b>1</b>	<b>45</b>	<b>Resistant</b>	<b>9</b>	<b>0</b>	<b>51</b>	<b>Resistant</b>

**Table 6.** Quality properties of PT5019 and check cultivars in the Parkland Wheat Registration Trial from 2023-2025. Flour, dough, and baking tests are based on 74% extraction flour.

Entry	Wheat and Flour Characteristics					Milling Performance		
	Wheat Protein	Flour Protein	Protein Loss	FN	Amylograph Peak	Clean Wheat Flour Yield	Flour Ash	Starch Dmg
<b>2023</b>								
Carberry	14.5	13.5	1.1	356	398	76.0	0.41	7.2
Glenn	14.9	14.0	0.9	345	526	76.1	0.41	7.8
AAC Brandon	14.6	13.6	1.0	331	425	77.2	0.41	7.4
AAC Penhold	13.6	12.8	0.8	350	428	76.5	0.43	6.6
Faller	13.5	12.5	0.9	322	569	77.0	0.39	7.8
Mean of Checks	14.7	13.7	1.0	344	450	76.4	0.41	7.5
<b>PT5019</b>	<b>14.0</b>	<b>13.0</b>	<b>1.0</b>	<b>399</b>	<b>582</b>	<b>77.2</b>	<b>0.42</b>	<b>7.9</b>
<b>2024</b>								
Carberry	15.3	14.5	0.8	362	497	76.4	0.41	6.9
Glenn	15.2	14.5	0.7	325	745	76.2	0.39	7.7
AAC Brandon	15.0	14.1	0.9	370	633	77.1	0.38	7.1
AAC Penhold	14.2	13.3	0.9	425	756	77.6	0.42	6.5
Faller	13.7	13.1	0.7	385	821	77.4	0.39	7.5
Mean of Checks	15.2	14.4	0.8	352	625	76.6	0.39	7.2
<b>PT5019</b>	<b>14.5</b>	<b>13.6</b>	<b>0.8</b>	<b>408</b>	<b>631</b>	<b>77.5</b>	<b>0.41</b>	<b>7.6</b>
<b>2025</b>								
Carberry	14.4	13.4	1.0	377	432	75.4	0.41	7.9
AAC Hodge	14.3	13.5	0.8	372	845	77.0	0.42	8.6
AAC Brandon	14.2	13.4	0.8	391	506	77.4	0.41	8.4
AAC Penhold	13.6	12.7	0.9	426	679	77.1	0.44	7.2
Faller	13.1	12.3	0.8	414	719	77.9	0.39	8.7
Mean of Checks	14.3	13.4	0.9	380	594	76.6	0.41	8.3
<b>PT5019</b>	<b>13.9</b>	<b>13</b>	<b>0.9</b>	<b>426</b>	<b>578</b>	<b>76.5</b>	<b>0.42</b>	<b>8.6</b>

Table 6. continued

2023	Dough Properties						Baking Quality				
	Farino Abs	Farino DDT	Farino Stab	EXT Area	EXT Rmax	EXT Length	Lean No Time (LNT) Method				
	Abs	Pk Time	WHR/KG	LV	LTR						
Carberry	64.3	7.3	8.8	139	537	21	73	3.8	9.6	768	0.55
Glenn	66	6.4	11	150	686	18.2	75	4.4	11.8	834	0.59
AAC Brandon	66.8	6.9	9.8	109	429	20.3	76	3.3	9.1	790	0.48
AAC Penhold	62.8	6.5	11.1	137	647	17.4	72	4	10.1	798	0.56
Faller	64.4	6.2	8.1	125	545	18.4	73	3.4	9	769	0.56
Mean of Checks	65.7	6.9	9.9	133	551	19.8	75	3.8	10.2	797	0.54
<b>PT5019</b>	<b>66.7</b>	<b>7.2</b>	<b>8</b>	<b>120</b>	<b>470</b>	<b>20.5</b>	-	-	-	-	-
<b>2024</b>											
Carberry	64.2	7.8	9.1	124	507	19.4	74	3.7	9.3	735	0.5
Glenn	65.4	9.3	12.3	156	748	17.6	74	4.4	11.2	823	0.61
AAC Brandon	65.4	7	10.8	102	431	18.6	74	3.4	9.2	749	0.48
AAC Penhold	62.6	7.3	12.2	138	680	16.6	72	4.2	10.9	739	0.52
Faller	63.7	7.7	11.3	139	566	19.3	73	4.1	11.2	798	0.57
Mean of Checks	65	8	10.7	127	562	18.5	74	3.8	9.9	769	0.53
<b>PT5019</b>	<b>65.6</b>	<b>7.8</b>	<b>9.4</b>	<b>121</b>	<b>485</b>	<b>19.4</b>	<b>75</b>	<b>3.6</b>	<b>9.2</b>	<b>754</b>	<b>0.52</b>
<b>2025</b>											
Carberry	65.4	6	7.5	103	371	21.5	75	3.4	6.9	772	0.49
AAC Hodge	65	6.8	12.9	135	641	17.1	74	4.5	9.2	824	0.59
AAC Brandon	67	6.7	7.9	77	318	18.7	76	3	7.5	724	0.45
AAC Penhold	63.9	6.8	10.2	124	550	17.8	74	3.6	7.7	759	0.49
Faller	65.9	5.3	8.3	100	402	19.5	75	3.1	6.2	792	0.49
Mean of Checks	65.8	6.5	9.4	105	443	19.1	75	3.6	7.9	773	0.51
<b>PT5019</b>	<b>67.2</b>	<b>6.4</b>	<b>6.1</b>	<b>93</b>	<b>360</b>	<b>19.7</b>	<b>76</b>	<b>2.9</b>	<b>6.3</b>	<b>734</b>	<b>0.47</b>

**Table 6.** continued

	Water dough colour			
	L*		b*	
	2h	24h	2h	24h
<b>2023</b>				
Carberry	75.6	71.3	24.9	23.5
Glenn	74.3	69.7	24	22.5
AAC Brandon	75.7	71.8	25.7	24.6
AAC Penhold	74.9	68.4	25.3	21.6
Faller	76.5	72.7	20.2	19.4
Mean of Checks	75.2	70.9	24.9	23.5
<b>PT5019</b>	<b>75</b>	<b>70.6</b>	<b>26.6</b>	<b>25.3</b>
<b>2024</b>				
Carberry	75.9	72.4	24.3	23.3
Glenn	75.1	71.5	23.7	22.7
AAC Brandon	76.2	72.8	25.5	24.6
AAC Penhold	74.7	68.7	25.5	21.8
Faller	76.5	73.5	20.6	19.9
Mean of Checks	75.7	72.2	24.5	23.5
<b>PT5019</b>	<b>75.4</b>	<b>71.4</b>	<b>26.1</b>	<b>24.8</b>
<b>2025</b>				
Carberry	75.6	72.1	24.6	23.2
AAC Hodge	75.3	71.6	27.6	25.2
AAC Brandon	75.6	72.3	25.3	24.1
AAC Penhold	74.8	68.4	25.8	21.9
Faller	76.9	73.5	20.3	19.6
Mean of Checks	75.5	72	25.8	24.2
<b>PT5019</b>	<b>74.9</b>	<b>70.8</b>	<b>26.7</b>	<b>25.5</b>