Request for Support for Registration of TR23848

Crop: Barley (*Hordeum vulgare* L.)
Type: Two-row, spring, hulled (Malt)

Proposers:
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Test #'s: TR23848 or SM205001
Pedigree: SM135283 x CDC Goldstar

Area of Adaptation: Western Canada

Description:

TR23848 is a null lipoxygenase, two-row, hulled malt barley with good adaptability across Western Canada. It combines good grain yield (98% of AAC Synergy) and lodging resistance with average height and maturity. It shows similar physical grain quality as the malt checks and displays resistance to loose smut and surface smuts, and intermediate resistance to stem rust, net-form net blotch and FHB. The malting profile of **TR23848** shows lower enzymatic power (similar to CDC Copeland), low beta-glucan (between the checks), elevated FAN (> checks) and high extract (> checks). Most other malt and wort characteristics are similar to the checks, with the exception of elevated soluble protein and Kolbach Index values. **TR23848** represents an agronomic improvement over CDC Goldstar (the previously commercialized null lipoxygenase variety) and has been undergoing brewing tests by Sapporo Breweries. **TR23848** will be available without restrictions to other maltsters and breweries.

Strengths:

- Good grain yield (98% of AAC Synergy) and lodging resistance (= checks).
- Low malt beta-glucan (between checks).
- High extract (> checks) and FAN (> checks).
- Resistant to loose smut and surface smuts, intermediate resistance to stem rust, net-form net blotch and FHB.

Neutral characteristics:

- Height and maturity (similar to checks).
- Test weight, kernel weight, plumps/thins (similar to checks).
- Protein, GE, RVA, friability, AA, DP (similar to checks).

Weaknesses:

- Moderately susceptible to spot-form net blotch and scald; susceptible to spot blotch.

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Table 1. Grain yield for TR23848 and checks from the 2023 Western Co-operative 2R Malting Barley Registration Trial.

	Black Soil Zone		Black & Grey Zone		Brown Soil Zone		Irrigated		Combined	
Entry	kg/ha	% Synergy	kg/ha	% Synergy	kg/ha	% Synergy	kg/ha	% Synergy	kg/ha	% Synergy
CDC Copeland	5457	96	7474	94	4417	88	8549	101	6027	95
AAC Synergy	5690	100	7950	100	5046	100	8439	100	6337	100
CDC Austenson	5642	99	8027	101	5276	105	8556	101	6385	101
TR23848	**5662**	**100**	**8440**	**106**	**5001**	**99**	**7911**	**94**	**6340**	**100**
Station years	8		3		3		2		16	

Table 2. Grain yield for TR23848 and checks from the 2024 Western Co-operative 2R Malting Barley Registration Trial.

	Black Soil Zone		Black & Grey Zone		Brown Soil Zone		Irrigated		Combined	
Entry	kg/ha	% Synergy	kg/ha	% Synergy	kg/ha	% Synergy	kg/ha	% Synergy	kg/ha	% Synergy
CDC Copeland	4967	88	3482	92	4162	85	7359	94	4561	88
AAC Synergy	5635	100	3803	100	4879	100	7848	100	5175	100
CDC Austenson	5978	106	3673	97	4692	96	8271	105	5252	101
TR23848	**5420**	**96**	**3944**	**104**	**4422**	**91**	**7765**	**99**	**4945**	**96**
Station years	7		3		6		1		17	

Table 3. Grain yield for TR23848 and checks from the 2024 and 2025 Western Co-operative 2R Malting Barley Registration Trial.

	Black Soil Zone		Black & Grey Zone		Brown Soil Zone		Irrigated		Combined	
Entry	kg/ha	% Synergy	kg/ha	% Synergy	kg/ha	% Synergy	kg/ha	% Synergy	kg/ha	% Synergy
CDC Copeland	5538	102	5478	93	4247	86	8153	99	5272	92
AAC Synergy	5446	100	5876	100	4935	100	8242	100	5738	100
CDC Austenson	5731	105	5478	93	4887	99	8461	103	5801	101
TR23848	**5466**	**100**	**6192**	**105**	**4615**	**94**	**7863**	**95**	**5625**	**98**
Station years	15		6		9		3		33	

Table 4. Agronomic characteristics for TR23848 and checks from the 2023 Western Co-operative 2R Malting Barley Registration Trial.

Entry	Days to Head	Days to Mature	Height (cm)	Lodging (1-9)	Test Wt. (kg/hl)	Kern. Wt. (g/1000k)	Plump (% >6/64)	Thins (% <5/64)
CDC Copeland	57.4	86.4	76.1	1.9	65.9	46.5	93.6	1.6
AAC Synergy	52.4	86.3	70.4	1.6	66.6	49.1	96.0	1.1
CDC Austenson	54.8	87.1	71.1	1.9	68.9	48.6	92.1	1.9
TR23848	**53.7**	**86.2**	**71.6**	**2.5**	**65.9**	**48.9**	**94.0**	**1.5**
Station years	18	18	18	4	18	18	16	12

Table 5. Agronomic characteristics for TR23848 and checks from the 2024 Western Co-operative 2R Malting Barley Registration Trial.

Entry	Days to Head	Days to Mature	Height (cm)	Lodging (1-9)	Test Wt. (kg/hl)	Kern. Wt. (g/1000k)	Plump (% >6/64)	Thins (% <5/64)
CDC Copeland	62.2	86.7	79.7	2.3	61.2	39.7	79.1	2.7
AAC Synergy	60.2	87.1	79.5	2.6	63.0	42.1	84.7	1.7
CDC Austenson	61.8	88.3	76.9	2.0	64.3	41.5	76.4	3.0
TR23848	**60.2**	**86.4**	**79.5**	**2.1**	**61.0**	**41.3**	**78.4**	**2.5**
Station years	15	15	15	9	18	18	17	14

Table 6. Agronomic characteristics for TR23848 and checks from the 2023 and 2024 Western Co-operative 2R Malting Barley Registration Trial.

Entry	Days to Head	Days to Mature	Height (cm)	Lodging (1-9)	Test Wt. (kg/hl)	Kern. Wt. (g/1000k)	Plump (% >6/64)	Thins (% <5/64)
CDC Copeland	58.4	86.5	77.7	1.9	63.6	43.1	86.2	2.5
AAC Synergy	56.7	86.6	74.5	1.9	64.8	45.6	90.2	1.6
CDC Austenson	57.9	87.7	73.7	1.7	66.6	45.0	84.0	3.3
TR23848	**56.5**	**86.3**	**75.2**	**1.9**	**63.5**	**45.1**	**86.1**	**2.5**
Station years	33	33	33	13	36	36	33	26

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Table 7. Disease reaction summary for TR23848 and checks from the 2023 and 2024 Western Co-operative 2R Malting Barley Registration Trial.

		Net Blotch							Scald				Spot Blotch					
		Seedling			Net-form Field		Spot-form Field	Merit	Seedling	Field		Merit	Seedling	Field				Merit
Entry		102	858	MBV25	Lac	Mel	Lac	Net/Spot	2275	Lac	Edm		1903	Brd	Ros	Mel	Lac	
CDC Copeland	2023	2	5	2	3.0	-	4.5	0/0	S	6.0	8.0	-	7	7.0	-	-	5	-
	2024	3	6	3	1.5	-	3.0	0/+	S	5.0	4.5	-	5	6.5	7.5	5.5	3	-
					I/ I			0/0		MS		-			MS			-
AAC Synergy	2023	1	2	1	0.0	-	4.0	+/+	S	6.0	7.5	-	3	2.0	-	-	3.5	+
	2024	1	2	2	0.0	-	2.0	+/+	S	3.5	7.0	-	3	4.5	6.5	5.0	2.0	0
					MR/MR			+/+		S		-			MR			+
CDC Austenson	2023	2	7	5	0.0	-	4.0	0/-	S	4.5	7.0	-	7	2.0	-	-	3.5	+
	2024	1	6	5	0.0	-	2.5	0/0	S	4.5	4.0	-	2	3.0	5.5	5.0	1.0	+
					I/I			0/0		MS		-			I			+
TR23848	**2023**	**2**	**6**	**7**	**1.0**	**-**	**4.0**	**0/-**	**S**	**6.0**	**8.0**	**-**	**7**	**7.0**	**-**	**-**	**5**	**-**
	2024	**2**	**4**	**7**	**1.0**	**-**	**3.5**	**+/-**	**MS**	**3.5**	**0.0**	**0**	**5**	**7.0**	**6.0**	**5.5**	**3.0**	**-**
					I/MS			**0/-**		**MS**		**-**			**S**			**-**

Table 7 (cont). Disease reaction summary for TR23848 and checks from the 2023 and 2024 Western Co-operative 2R Malting Barley Registration Trial.

		Surface Smuts				Loose Smut		Stem Rust					Fusarium Head Blight								
			AAFC-MRDC		Merit	USask	Merit	Field		USask	Seedling	Merit	Rating	Charlottetown					DON		Merit
Entry		USask	U. hordei	U. nigra		U. nuda		Cov	React	*Rpg1*	MCC		Bran	Mor	Sev.	Inc.	Index	Bran	Mor	Avg	
CDC Copeland	2023	-	8	17	+	-	NR	1	R	6R	0;	+	2.5	0.8	-	-	-	17.4	2.2	9.8	0
	2024	21	4	22	+	5.3	+	2	MR	6R	;11+	+	2.5	4.0	-	-	-	13.8	31.8	22.8	0
			MR		+	R	+			MR		+					I				0
AAC Synergy	2023	-	20	19	+	-	NR	1	R	6R	0;	+	1.3	0.2	-	-	-	29.5	0.3	14.9	0
	2024	25	21	28	+	22.6	+	1	R	6R	;1-	+	1.8	2.8	-	-	-	23.9	49.8	36.8	0
			MR		+	MR	+			R		+					I				0
CDC Austenson	2023	-	6	9	+	-	NR	1	R	6R	0;	+	1.5	0.2	-	-	-	36.0	2.1	19.0	-
	2024	6	10	9	+	-	NR	10	MR	6R	;1-	+	1.7	2.5	-	-	-	21.0	46.2	33.6	0
			R		+	-	NR			MR		+					I				0
TR23848	**2023**	**-**	**11**	**19**	**+**	**-**	**NR**	**2**	**I**	**6R**	**0;**	**0**	**3.5**	**0.5**	**-**	**-**	**-**	**35.2**	**2.6**	**18.9**	**0**
	2024	**19**	**15**	**19**	**+**	**0.0**	**+**	**2**	**MR**	**6R**	**;11+**	**+**	**3.0**	**3.5**	**-**	**-**	**-**	**30.6**	**73.5**	**52.1**	**-**
			MR		**+**	**R**	**+**			**I**		**0**					**I**				**0**

Table 8. Average malting characteristics for TR23848 and checks from the 2023 Western Co-operative 2R Malting Barley Registration Trial.

	Plump			1000		G. E.			Steep										
	>7.0	>6.0	>5.5	K.Wt.	Prot.	4 ml	8 ml	RVA	Moist	Friab.	P&B	DP	AA	F.Ext.	SP	KI	FAN	BG	Visc.
Entry	(%)	(%)	(%)	(g)	(%)	(%)	(%)	(RVU)	(%)	(%)	(%)	(°L)	(D.U.)	(%)	(%)	(%)	(mg/L)	(mg/L)	(cP)
CDC Copeland	47.7	93.7	97.3	48.8	12.2	99	95	141	46.0	79.5	2.6	160	67	80.1	4.77	38.3	187	87	1.45
AAC Synergy	64.9	96.9	98.7	51.5	12.3	99	90	116	46.2	80.6	2.6	165	75	80.8	4.88	40.6	200	48	1.42
TR23848	**59.9**	**96.0**	**98.9**	**51.3**	**12.6**	**99**	**91**	**127**	**46.2**	**78.3**	**1.8**	**183**	**89**	**81.2**	**4.76**	**39.0**	**188**	**82**	**1.43**
Station Years	3	3	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	3	3

Table 9. Average malting characteristics for TR23848 and checks from the 2024 Western Co-operative 2R Malting Barley Registration Trial.

	Plump			1000		G. E.			Steep										
	>7.0	>6.0	>5.5	K.Wt.	Prot.	4 ml	8 ml	RVA	Moist	Friab.	P&B	DP	AA	F.Ext.	SP	KI	FAN	BG	Visc.
Entry	(%)	(%)	(%)	(g)	(%)	(%)	(%)	(RVU)	(%)	(%)	(%)	(°L)	(D.U.)	(%)	(%)	(%)	(mg/L)	(mg/L)	(cP)
CDC Copeland	49.0	91.6	97.6	43.6	12.3	97	93	79	46.6	83.0	2.6	166	76	79.5	5.04	40.5	206	59	1.44
AAC Synergy	67.6	95.5	98.3	46.9	12.9	99	96	59	47.2	74.1	4.1	175	85	80.4	5.37	44.1	221	47	1.42
TR23848	**60.3**	**93.1**	**97.4**	**47.9**	**13.1**	**97**	**88**	**79**	**47.1**	**78.0**	**6.6**	**163**	**84**	**80.8**	**5.72**	**45.3**	**233**	**48**	**1.43**
Station Years	3	3	3	3	3	3	3	2	3	2	2	3	3	3	3	3	3	3	3

Table 10. Average malting characteristics for TR23848 and checks from the 2024 Collaborative Trial.

Entry	>7.0 (%)	Plump >6.0 (%)	>5.5 (%)	1000 K.Wt. (g)	Prot. (%)	Barley P&B (%)	G. E. 4 ml (%)	G. E. 8 ml (%)	Steep Moist (%)	Chit (%)	Friab (%)	Malt P&B (%)	DP (°L)	AA (D.U.)	F.Ext. (%)	SP (%)	KI (%)	FAN (mg/L)	BG (mg/L)	Visc. (cP)
CDC Copeland	40.1	86.4	95.9	43.2	12.6	2.4	95	87	44.2	86	74.5	3.0	159	67	79.8	5.30	42.3	220	138	1.46
AAC Synergy	48.6	91.4	98.1	44.4	12.0	3.7	95	88	44.6	87	79.4	3.3	151	80	81.3	5.22	44.9	217	76	1.44
TR23848	**41.4**	**86.7**	**96.6**	**43.9**	**12.4**	**5.1**	**97**	**82**	**44.7**	**84**	**78.8**	**4.8**	**140**	**77**	**81.8**	**5.64**	**48.5**	**247**	**98**	**1.44**
Station Years	5	5	5	5	5	4	5	5	5	5	3	3	5	5	5	5	5	5	5	5

Table 11. Average malting characteristics for TR23848 and checks from the 2025 Collaborative Trial.

Entry	>7.0 (%)	Plump >6.0 (%)	>5.5 (%)	1000 K.Wt. (g)	Prot. (%)	Barley P&B (%)	G. E. 4 ml (%)	G. E. 8 ml (%)	Steep Moist (%)	Chit (%)	Friab (%)	Malt P&B (%)	DP (°L)	AA (D.U.)	F.Ext. (%)	SP (%)	KI (%)	FAN (mg/L)	BG (mg/L)	Visc. (cP)
CDC Copeland	69.5	95.8	98.8	39.4	11.7	1.9	98	90	43.8	97	81.2	5.8	169	72	81.4	5.20	45.8	210	171	1.48
AAC Synergy	79.8	97.1	99.3	40.6	12.1	2.1	99	85	44.8	95	83.1	5.9	176	82	82.0	5.42	47.4	226	106	1.45
TR23848	**72.8**	**96.3**	**99.4**	**49.4**	**11.7**	**5.5**	**98**	**76**	**44.7**	**89**	**83.5**	**8.7**	**154**	**85**	**82.7**	**5.80**	**51.0**	**236**	**152**	**1.47**
Station Years	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5